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OF
INDUSTRY, SCIENCE, AND ART:

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⁂ *Communications for the Journal to be addressed to the General Editor,* Prof. Hincks, *Univ. Coll., Toronto. Communications on general business of the Institute, to be addressed to* U. Ogden, *Esq., M.D., Corresponding Secretary, or to Mr. Jas. Johnson, Assistant Secretary, Canadian Institute, Toronto.*

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THE CANADIAN JOURNAL.

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No. LXI.—JANUARY, 1866.

THE OPTICAL DEFECTS OF THE EYE AND THEIR TREATMENT BY THE SCIENTIFIC USE OF SPECTACLES.

BY A. M. ROSEBRUGH, M.D.

(Read before the Canadian Institute, February 3rd, 1866.*)*

The following pages were written as an introduction to a course of lectures recently delivered by me on the diseases of the eye. I have not thought it necessary to alter the form, as I propose publishing them as a pamphlet, hoping that they may be useful, not only to the members of my ophthalmic class, but to Canadian medical students generally.

In their preparation, I must here acknowledge my indebtedness to the elaborate works of Mr. J. Z. Laurence and Mr. J. Soelberg Wells, of London, and especially to the very comprehensive treatise of Professor Donders, of Utrecht, published in 1864 by the New Sydenham Society.

CHAPTER I.—OPTICAL CONSIDERATIONS.

The eye is pre-eminently an optical instrument, and the phenomena of vision all depend upon the laws of optics. Hence, a knowledge of some, at least, of the elementary principles of light is essential to a correct appreciation of the physiology of the eye. The diagnosing of optical defects of the eye,—long and short sight, &c. &c., and their treatment with the scientific use of spectacles, require some knowledge of the laws of refraction, and the properties of convex and concave lenses.

The philosophy of the ophthalmoscope can hardly be understood unless the principles of both refraction and reflection are thoroughly mastered.

You will therefore, I hope, not consider the time ill spent if, before proceeding with the investigation of diseases of the eye—you review with me some of the elementary principles of optics which lie at the foundation of all ophthalmic science.

The *nature* of light is not known. I can no more tell you what light is, than your professor of physiology can tell you what life is. We know that the sun shines, but how it shines we cannot tell.

"Two different theories have been advanced of the more intimate nature of light." "One, the *Newtonian* (*corpuscular*) conceives that each luminous point is constantly giving off a succession of luminous corpuscles which follow each other in uninterrupted succession on an imaginary line or axis like a string of beads on a rigid thread."

The *undulatory* theory (Christian Huychens') on the other hand considers space as pervaded by a subtle gaseous fluid or ether; that luminous bodies have the power of communicating to this ether a wave motion which affects the retina the same as vibrations of the air affect the auditory nerve.

Sir John Herschel, speaking of the great ingenuity of the undulatory theory says, "if it is not true it deserves to be."

The sun is the great natural source of light; as it shines by its own light it is called *self-luminous.* The fixed stars are also self-luminous; so is a lighted lamp and bodies in a state of ignition. But most bodies by which we are surrounded, are seen only by reflected light. The light from an object seen by moonlight is reflected twice before it reaches the eye. The moon reflects the light from the sun, and the object, the light which it receives from the moon.

Every luminous object gives off, or radiates, in every direction, an infinite number of straight lines of light. Each of these lines taken alone is called a *ray* of light. A bundle of rays is called a *beam* of light when the rays run *parellel* to each other. When the rays *diverge* from a luminous point or are made to *converge* to a focus they are called a *pencil* of rays, thus :

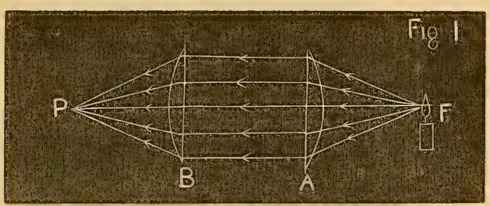

Fig. 1 represents a pencil of rays diverging from a flame F, after passing a convex lens they are rendered parallel and these parallel rays passing the second convex lens B, the rays are converged to the point (focus) P.

The parallel rays may be called a *parallel* pencil ; the diverging rays a *divergent* pencil, and the convergent rays a *convergent* pencil. The point where rays of light meet is called the *focal* point or simply a *focus.*

Strictly speaking, there is no such thing in nature as parallel rays ; the nearest approach we have to it are the rays of light we receive from the sun and the fixed stars. Practically, for our purpose however, we may consider rays of light parallel that are received by the pupil of the eye from objects that are twenty feet distant or any distance greater than that. Pencils of light from objects less than twenty feet distant are more decidedly divergent.

A good illustration of a divergent pencil can be obtained from a lighted lamp or candle in a dark room. If a piece of card board, with a small circular opening in it, be held near the lamp, you will have, upon the opposite wall, an illuminated spot of the same shape as the opening in the card, but very much larger.

This will prove not only that the rays *diverge*, but also that the rays proceed in straight lines.*

Convex lenses :—We shall now proceed to the consideration of convex lenses, which, for our purpose, is the most important part of the subject. Lenses are made of various transparent substances as amber, alum, quartz, glass, diamond, and even of ice. Those in ordinary use are made of glass. When the two surfaces of a convex lens have the same degree of curvature, the lens is said to be equi-convex. When one of the surfaces is flat or plane, the lens is called a plano-convex lens. Glass spectacles used by old persons for reading, &c., are commonly made double convex.

In order to simplify the subject as much as possible, let us confine our attention to lenses that are equi-convex.

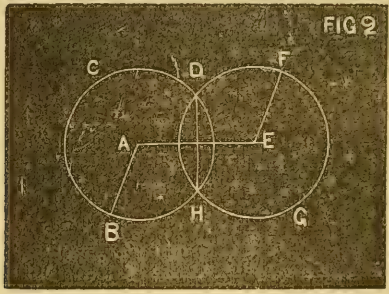
FIG 2

In fig. 2 let A be the centre of the circle B, C, D, of which A, B, is the radius, and let E be the centre of the circle F, G, H, of which the radius E, F, is equal to the radius A, B. The circle F, G, H, will be equal to the circle B, C, D. The part D,H, common to both circles, represent a section of an equi-convex lens. The line A,E, is called the *axis* of the lens, and the line D, H is called the *diameter*. The centre of the diameter (where it is intersected by the axis) is the optical centre of the lens.

Reading glasses, and burning glasses, are examples of a double convex lens. Many of you have, doubtless, seen the experiment of

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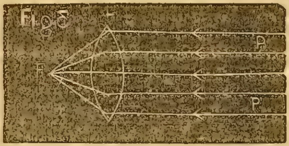
(* Convergent pencils of light do not exist in nature. Parallel pencils or divergent pencils of rays can be rendered convergent by means of a convex lens. Thus in fig. 1, the rays diverging from F, are made to *converge* to P by the convex lenses, A, and B.)

setting fire to wood, paper, &c., by means of a burning or sun glass. The explanation of this is simply that the convex lens possesses the property of converging a portion of the sun's rays to a point called the focus.



In Fig. 3, P, P, represent a pencil of parallel rays converged to a focus at F by means of the double convex lens, L.

The focus for parallel rays is called the *principal* focus. It is always the same distance from the optical centre in the same lens. The length of the focus for parallel rays is, in equi-convex lenses, equal to the length of the radius of curvature.

The shorter the focus, the greater is the "power" or "strength" of the lens. A lens that can bring parallel rays to a focus at a distance of one inch from the optical centre of the lens, would be called a *one inch* lens. Another lens whose focus is two inches from the optical centre, is called a *two inch* lens, and so on. Convex lenses therefore receive their names according to the number of inches, or fraction of an inch, the principal focus is distant from the centre of the lens. The strongest lenses used for spectacles are what are called cataract glasses; they are worn by patients who have had their crystaline lenses removed. Their strength ranges from 2 to 4 inches focal length. The weakest spectacles that are ordinarily used have a focus of 36 inches. Convex lenses having a focus of 36 inches do not enlarge the letters of a book at the ordinary reading distance.

Let us now see what practical application we can make of this principle of convex lenses.

Supposing that a person accustomed to using convex spectacles, gets one of the glasses broken, and applies to you to learn the strength of the glass that would be necessary to replace the broken one, or in other words—to learn the strength of the glass that is still whole. How would you proceed? One method is to use the lens as a sun glass, and ascertain by measurement, how far from the glass, the sun's rays are brought to a focus. If you find, for instance, that the focus is 10 inches from the lens, you will have ascertained that the person has been wearing glasses of 10 inch focus, or as they are sometimes called No. 10 convex, or simply + 10 (plus 10).

The method, however, that is usually adopted, depends upon a property of convex lenses that will be more fully explained further on.

If, for instance, you hold up a 10 inch convex lens at a distance of 10 inches from a white wall—the wall being about 20 feet from an open window, opposite—there will appear, behind the lens, upon the wall, an inverted, miniature picture of the window, and trees or buildings, &c., in front of the window. If the lens be held at a greater or less distance from the wall than the focal length of the lens, the inverted picture will be indistinct. Measuring the distance therefore that the lens must be held from the wall, to produce the sharpest picture, will give the focal length of the lens.

Suppose, now, that we bring the lens to within, say 5 feet of the window, and hold a sheet of white paper at the principal focal distance behind the lens, viz., at ten inches, we will find a change in the inverted picture, there will still appear distant buildings, trees, &c. but the sash of the window will be very indistinct. If, however, we move the sheet of paper 12 inches from the lens—that is, two inches farther from the lens, we will again see the image of the sash but scarcely any trace of the buildings, trees, &c. This experiment is an illustration of the fact that the nearer an object approaches the front of a convex lens, the farther will be its image behind the lens ; thus, when an object is 5 feet or rather 60 inches from the front of a 10 inch convex lens, the inverted image is found to be 12 inches behind the lens ; when 30 inches, it will be 15 in. ; when 20, that is, double the length of the focus, the image will be double the length of the focus behind the lens ; viz., 20 inches ; when 15 inches, the image behind the lens will be removed to 30 inches. As the object approaches the principal focal distance of the lens the image recedes much more rapidly ; thus, when at 12 inches, the image will be 60 inches ; when at 11, the image will be 110 inches behind the lens. When however we bring the object to within 10 inches of the lens—that is, at its principal focus, there will be no image formed behind the lens, as the rays after passing the lens will be parallel.

(I would strongly urge you, gentlemen, to perform all these experiments for yourselves, as in that way only can you become familiar with these important principles. These latter experiments can be performed best in a dark room—taking for an object the flame of a lamp or candle).

From the above we can easily understand the principle, 1st, that the *less* divergent the rays of a pencil (that is, the nearer they approach parallel rays,) incident or falling upon a convex lens, the nearer will the focus of the convergent pencil be to the principal focus of the lens. 2nd. The *more* divergent the incident pencil, the less convergent (the more nearly parallel) will be the refracted pencil, and the more distant will its focus be from the principal focus of the lens.

Questions of the following nature very often arise in optics, viz., the length of the principal focus of a convex lens being given, and the distance a certain object is in front of it;—to find how far behind the lens will be the inverted image of the object. Or to express it more technically, the length of the principal focus of a convex lens being given and the length of the divergent incident pencil, to find the length of the focus of convergent refracted pencil. Thus: Suppose you had the following question: A 10 inch lens is 60 inches from an object; how far behind the lens will be the inverted image?

This could be solved immediately, by actual trial, and measurement, but this is not always practical.

The rule given in some text books on optics is as follows: multiply the length of the divergent incident pencil, that is, the distance the object is from the lens, by the focal length of the lens, and divide by the difference; thus: $60 \times 10 = 600$, $60 - 10 = 50$, 600 divided by $50 = 12$; or $\frac{60 \times 10}{60 - 10} = \frac{600}{50} = 12 =$ the distance behind the lens.

There is another property of convex lenses which I must not omit to mention; namely, what is called it magnifying power.

When a convex lens is placed between the eye and an object,—the object being at a less distance from the lens than its principle focus, the object will appear enlarged or magnified. The shorter the focus of the lens, the greater is its magnifying power. Thus, a 4 inch lens has a greater magnifying power than an 8 inch lens; a 2 inch lens greater than a 4, and a 1 inch greater than a 2 inch lens. The 1 inch lens has, in fact, double the magnifying power of a 2 inch lens; a 2, double that of 4 inch; a 4 inch, double that of an 8 inch, &c.

The "power" of a lens is therefore inversely proportional to its focal length. For this reason a different form is used in expressing the "power" or strength of a lens. A 1 inch lens is taken as unity, and as a 2 inch lens is just half the strength, it is simply expresed $\frac{1}{2}$, and as a 3 inch lens has just one-third the strength of a 1 inch, it is written $\frac{1}{3}$; a 4 inch is $\frac{1}{4}$ &c. We will find that this nomenclature is not only very convenient, but scientifically correct.

For example, suppose we have two lenses of 4 inch focus each, and we wish to know their combined "power" when used as one lens; we simply add their reciprocals thus $\frac{1}{4}+\frac{1}{4}=\frac{2}{4}=\frac{1}{2}$. The two lenses have, therefore, the magnifying power of $\frac{1}{2}$, which is the reciprocal of 2, and are consequently, together, equal to a 2 inch lens, which can be proved by actual measurement. Again, suppose we have a 6 inch lens, and a 12 inch lens, and we wish to know their combined strength, $\frac{1}{6}+\frac{1}{12}=\frac{3}{12}=\frac{1}{4}$ which represents the power of a 4 inch lens; the 6 and the 12 inch lenses taken together being equal to one lens having a focus of 4 inches.

To save repetition, I may here state that when a *concave* lens enters into combination with a *convex* lens, it has a neutralizing effect upon the convex lens. If we have a convex 6 and a concave 6 the one would neutralize the other,—thus $\frac{1}{6}-\frac{1}{6}=0$. But if the convex lens has the higher power, the concave lens simply weakens it—that is, lengthens its focus—thus, if we have a convex 6 and a concave 9 the result will be $\frac{1}{6}-\frac{1}{9}=\frac{3}{18}-\frac{2}{18}=\frac{1}{18}$, which represents the strength of one lens having a focus of 18 inches. If, however, the concave lens has the higher "power" it will simply be weakened by the concave lens,—the combination will be equal to a concave lens having a lower "power," or a longer focus than the concave lens taken,—thus reversing the last example, suppose we have a *concave* 6 and a *convex* 9, we will then have $-\frac{1}{6}+\frac{1}{9}$ or simply $\frac{1}{9}-\frac{1}{6}=\frac{2}{18}-\frac{3}{18}=-\frac{1}{18}$, which represents the strength of a *concave* lens having a focus of 18 inches.

This fractional nomenclature (taking 1 for numerator and the focal length of the lens for denominator) will assist us also in understanding the principle of the formation of images at different distances behind a convex lens, according to the distance of objects in front of it.

Let me remind you that when an object, for instance the flame of a candle, is placed in the focus of a convex lens, the diverging rays of light from the object are rendered parallel by the lens. Thus, a lens having a focus of 20 inches will render parallel pencils of light diverging from an object 20 inches from the lens. Bearing this in mind let us again try the solution of the following question, propounded not long since, viz. :—When an object is 60 inches in front of a 10 inch convex lens, how far behind the lens will be the inverted image of the object? Or, to express it differently, when a divergent pencil of light emanates from a point 60 inches from a 10 inch convex lens, at what distance behind the lens will the pencil be converged to a focus ?

Now, we know that a lens of 60 inches focus, placed in the position of the 10 inch lens, would render the rays parallel that fall upon it from the object 60 inches distant. Were it possible, therefore, to divide the 10 inch lens into two lenses, one having a focus of 60 inches to render the rays parallel, the remaining portion would bring these parallel rays to a focus at its principle focus. Deducting then $\frac{1}{60}$ from $\frac{1}{10}$ will give the strength of the remaining portion of the lens $\frac{1}{10}-\frac{1}{60}=\frac{5}{60}=\frac{1}{12}$; the two parts then $\frac{1}{60}$ and $\frac{1}{12}$ are equal to the one lens $\frac{1}{10}$. And, as the $\frac{1}{60}$ will render the rays parallel from the object 60 inches distant, and these parallel rays falling upon the other part $\frac{1}{12}$, they will be brought to a focus at the principle focus of this part, viz : at 12 inches from the lens. Let us illustrate this with another example. Suppose that an object is 30 inches in front of a convex lens of 10 inch focus, and we wish to know how far behind the lens will be the focus of a pencil of rays diverging from a point in the object. We will have $\frac{1}{15}-\frac{1}{30}=\frac{2}{30}=\frac{1}{15}$; this $\frac{1}{15}$ represents the power of a 15 inch lens, which we know will bring the parallel rays to a focus at 15 inches behind the lens.

FIG. 4.

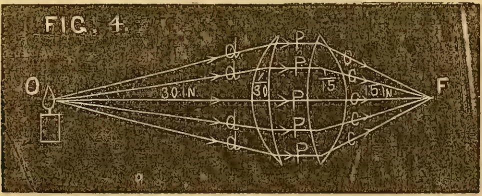


Fig. 4 illustrates this ; O represents an object 30 inches from a ten inch convex lens, the lens supposed to be divided into two parts, one having a focus of 30 inches, and the other a focus of 15 inches. The 30 inch lens refracts the rays of the divergent pencil d, d, d, d, so as to render them parallel, as shown at P, P, P, P, P. These parallel rays, meeting the 15 inch lens, are again refracted and are converged to a focus at F, which is the principle focus of the lens, viz., at 15 inches.

Fig. 1, page 3, represents a 10 inch lens, at a distance of 20 inches from an object, F. The lens is supposed to be divided into two equal parts, of 20 inch focus each: the first half renders the diverging pencil parallel, and the second half converges the parallel pencil to a focus, at 20 inches from the lens; $\frac{1}{10}-\frac{1}{20}=\frac{1}{20}$.

(Dr. Giraud-Teulon, of Paris, has ascribed the origination of the above theory to Mr. J. Z. Laurence, of London, to whom we are very much indebted, for his praiseworthy efforts to popularize this, hitherto neglected, field of Physiological and Pathological Optics.)

Let me next direct your attention to certain optical considerations, which have a most important application, in the treatment of optical defects of the eye.

You may remember that in a former experiment, a 10 inch lens was held ten inches from a white wall, so as to show the miniature inverted picture of the window, &c., 20 ft. distant; and that when the lens was brought to a distance of 60 inches from the window, it was found that the image of the window was formed 12 inches behind the lens, instead of 10 inches, and that at 10 inches, the image was so indistinct as to be scarcely recognizable.

Now suppose that a 12 inch lens be immovably fixed 12 inches from the same wall, it will then be in a proper position to bring parallel rays to a focus on the wall, where it will form an inverted picture of the window, and objects at a distance beyond the window.

If we now bring the flame of a lamp, for instance, to a distance of 60 inches from the lens, no distinctly defined image of the flame will appear upon the wall; but if, by any means, we can render the pencil parallel that diverges from the flame, the 12 inch lens will then converge it accurately to a focus upon the wall, where we will have an inverted image of the flame.

From the knowledge that we have now obtained, we know that a 60 inch lens placed in front of the 12 inch lens will render these rays parallel. All that we have to do then is to combine a 60 inch lens with the 12 inch lens: the 60 inch lens to render the rays parallel that diverge from the flame, 60 inches distant, and the 12 inch lens to converge these rays to a focus, at the principal focal length of the lens. This is exactly what we do in supplying old people with convex spectacles. Their eyes are constructed to bring parallel rays to a focus, on the retina; but the rays from near objects are too divergent to be focussed upon the retina without artificial aid; this deficiency is what we supply with suitable glasses.

Before leaving the consideration of optical lenses, there is one subject to which I wish to direct your attention; namely, the formation of an inverted image behind a convex lens.

Many of you are, probably, familiar with the fact, that when light is admitted into a darkened room, through a small orifice, there appears upon the opposite wall of the room, an inverted, dim, shadowy picture of buildings, trees, &c., in front of the aperture. This can also be seen, on a smaller scale, by holding a sheet of white paper a few inches from the key-hole of a darkened hall.

The philosophy of this is seen in Fig. 5.

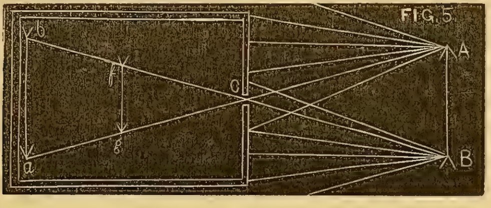


FIG. 5.

Let A, B, represent the position of a flame of a lamp that is a short distance in front of an aperture of a darkened box. Pencils of divergent rays of light radiate from the apex of the flame in every direction; one of these pencils is represented in the figure to illuminate the end of the box, and one of the rays escaping through the small orifice *c*; this ray passes in a straight line to the back of the box, and strikes the point *a*, which it illuminates.

Rays of light diverge from the lower part of the flame, also; one of these rays is shown to enter the aperture *c*, and to pass to the back of the box at *b*. In a similar way it might be illustrated that pencils of light radiate from every point in the flame A, B, and that one ray from each point passes into the box and illuminates a portion of the back. In this way we get an illuminated spot at the back of the box, which is an exact counterpart of the flame in front of the box, but *inverted*, the apex of the flame pointing downwards. The reason that the picture is reversed is that, as rays of light (in the same medium) pass in straight lines, a ray from the top of the flame, after passing the aperture, must necessarily pass to the lower part of the back of the box; and a ray from the lower part of the flame must necessarily (in moving in a straight line) pass to the upper part of the back of the box. You will observe, also, that the size of the image depends upon its distance behind the aperture; if the image is as far behind the aperture, as the object is in front, the image will be of the same size as the object, if half the distance, half the size, as seen at f, g.

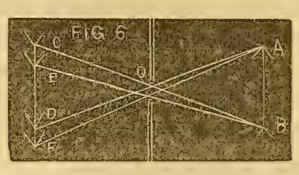


FIG 6

If, in the above experiment, the aperture be enlarged, it will be found that the image at the back of the box will become much less distinct; the more the aperture is enlarged, the more indistinct will be the image. The reason of this indistinctness in the image is that, when the aperture is enlarged, a number of diverging rays from one point in the flame pass through the aperture, and each one repeats the image, so that the parts of the image overlap each other.

This is shown in Fig. 6. A, B, represents the flame of the lamp, and C, E, D, F, the image behind an aperture. The aperture is supposed to be just large enough to admit two divergent rays, each of these rays produces a separate image; thus, the point A is repeated twice at D and F, and the point B is repeated at C and E. The larger the aperture, the more light is admitted, but the more indistinct is the image.

If now, a convex lens be inserted in the enlarged aperture, these divergent rays that enter the aperture (from every point of the object) are converged to a focus; thus in

Fig. 7.

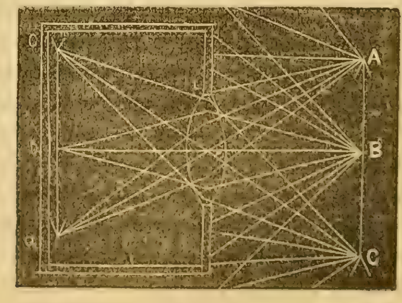


Fig. 7. A C represents an object in front of a convex lens, and *a c* the inverted image behind the lens. Rays diverging from the point A and falling upon the lens L are brought to a focus at *a;* rays from B are similarly focussed at *b*, and so on. In a similar manner, diverging rays from every point in the object A C that enter the lens are brought to a focus in the image between *a* and *c*. We will then have in the position of *a c* a distinct inverted image of the object A C. If this image is received upon a sheet of white paper we can see it only upon its front surface; but if it is received upon thin oiled paper, or upon ground glass, we can see it from behind; and if, while viewing the image from behind, the ground glass be removed, we can still see the inverted image (or at least a portion) occupying the same position as the ground glass just occupied—being suspended, as it were, in the air, and forming what is called an ærial image. In order to see this ærial image under favourable circumstances, one eye only should be used, and should be in a line with the lens and the object, and should be at least ten inches behind the position of the inverted lens.

CHAPTER II.—OPTICS OF NORMAL EYE.

The human eye, from before backwards, is about one inch in diameter. Its transparent media are the cornea, aqueous humour, crystaline lens, and vitreous humour. This combination, with the convexity of the cornea, is equal to a convex lens having a focus of about one inch (more accurately $\frac{18}{20}$ of an inch.)

When a normal eye is directed to a distant object (*i. e.* in a state of rest), parallel rays of light are brought to a focus upon the retina, and a very minute inverted picture of the object is sharply defined upon that membrane. If the sclerotic coat be removed from the back of the eye of an ox, and the eye be placed in an aperture of a darkened room, with the cornea looking, for instance, towards the opposite side of the street, an inverted image of the buildings, &c., in front of the aperture will be seen at the back of the eye.

The impression that objects make upon the retina, is conveyed through the optic nerve to the brain, but in what manner this communicates to the mind a knowledge of the appearance of objects, is more than we can tell. We can simply say with Potterfield, that "God has willed it so."

We are aware, however, that although the eye may be free from disease, and the connection between the retina and brain in every way perfect, if the optical mechanism of the eye be in any way defective so as to produce ill defined images upon the retina,—vision will be indistinct, and that the distinctness or indistinctness of vision will be in exact proportion to the distinctness or indistinctness of the inverted picture. Hence the necessity of understanding the optics of the eye in order to comprehend the pathology and treatment of the numerous optical defects to which it is liable.

Case 1. Let me here take an example. A few weeks ago a physician of this city sent a patient for my advice, fearing that he was losing the sight of his left eye. Upon examination, I found that he had what we call "paralysis of accommodation" of that eye.

He could see distant objects with perfect distinctness, but near objects he was unable to define; he could not read large type unless the letters were very large, and several feet from the eye. The eye was, in fact, simply passive, like a convex lens, or a camera-obscura with the screen to receive the image immovably fixed at the principal focus of the lens, and could only bring parallel rays to a focus on the retina.

I found that by rendering the diverging rays parallel, by means of a convex lens, he could see near objects distinctly; by placing a six inch convex lens before that eye, he could read fine type at six inches, with a 10 inch lens at ten inches, with an 18 inch lens at eighteen inches, &c. &c. The 6 inch lens rendered the rays parallel that diverged from the letters six inches distant, and these parallel rays falling upon the eye were brought to a focus upon the retina. [A 6 inch lens does not increase the apparent size of letters one-half, whereas this patient could not see letters ten times the ordinary size at six inches, or any distance less than about two feet from the eye.] The 10 inch lens rendered the rays parallel from objects ten inches distant, and the 18 inch lens from objects eighteen inches distant.

The eye was unable to bring diverging rays to a focus upon the retina; in other words it had lost the power of "accommodation." (We can temporarily paralyse the accommodation of the eye by applying a strong solution of Atropine.)

A normal eye differs from the glass lenses we have been describing in the fact that it can, not only focus parallel rays upon the retina, but also rays that diverge from objects as near as from four to six or eight inches from the eye. When parallel rays fall upon a 1 inch convex lens, they are brought to a focus one inch behind the lens, but if an object, for instance the flame of a lamp, be brought to within four inches of the lens, we know that the focus will fall farther than one inch behind the lens. If we wish to receive the inverted image of the lamp upon a screen, the screen must be held one inch and a third behind the lens.

Now when an object is brought to within, say four inches of the eye, it has no power to move the retina backwards to receive the image that would be formed behind that membrane, but, what answers the same purpose, it has the property of so far increasing its refractive power, as to be able not only to render parallel, these diverging rays, but also to focus them upon the retina. This increase in the power of the eye, is equal to the addition of a 4 inch lens in front of an eye that has its "accommodation" paralysed, as a 4 inch lens renders rays parallel that diverge from objects four inches distant.

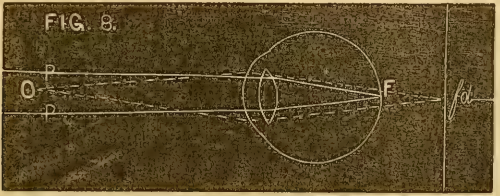


Fig. 8 represents the section of a normal eye. When it is accommodated for distant objects parallel rays P, P, are focussed upon the retina at F, while diverging rays from O, would form a focus at *fd.* When, however, the eye is accommodated for the near object O, these diverging rays are focussed upon the retina at F.

The manner in which this increase in the refractive power of the eye is effected is still a disputed point. Most physiologists however are now inclined to the theory that it is caused by an increase in the curvature,—a thickening from before backwards, of the crystaline lens.*

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* The accommodotion of the eye was at one time believed to be produced by the external muscles, but it is now ascertained that the accommodation can remain perfect with all the external muscles paralysed.

The iris was thought, by others, to have the power of increasing the refractive power of the eye, but it was proved by a case that occurred in Dr. Von Graefe's practice that accommodation can still be effected with entire absence of the iris.

Helmholtz and Cramer have proved by means of the opthalmometre, that when the eye is accommodated for a near object it undergoes the following changes:—

The "near" and "far" point.—The nearest point to which objects can be brought to an eye and be seen with perfect distinctness, is called the "near" point, and the farthest point of distinct vision is called the "far" point.

In a normal eye the "near" point is about seven inches from the front of the cornea, and the "far" point is at an unlimited distance. In childhood, however, the "near" point is about $3\frac{1}{2}$ inches from the eye and recedes as age advances. At the age of forty the "near" point of a normal eye is nearly eight inches from the eye.

When the "near" point recedes to a greater distance than eight inches from the eye it becomes inconvenient; such an eye is called *presbyopic* or long-sighted.

When the "far" point is not unlimited, but is at a definite distance from the eye, as for instance from six inches to four or five feet from the eye—such an eye is called *myopic* or short-sighted.

Range of Accommodation.—The distance between the "near" and "far" point in any eye, is called the "range of accommodation." If a person can read distinctly very fine type at four inches from the eye, and can also see clearly at an infinite distance the range of accommodation would be said to equal $\frac{1}{4}$ because, when such an eye is directed to objects at an infinite distance, (accommodated for parallel rays) in order to see clearly objects only four inches distant, it is necessary to increase the curvature of the crystaline lens, or in other words the "power" of the eye to an extent equal to the addition of a 4 inch convex lens; the power of which is expressed by $\frac{1}{4}$. If a person's "near" point is at eight inches from the eye, and his "far" point at an infinite distance. his range of accommodation would be said to equal $\frac{1}{8}$. If the "near" point of a myopic eye be 3 inches, and the "far" point be 12 inches, we get the range of accommodation by the equation $\frac{1}{3}-\frac{1}{12}=\frac{1}{4}$.

Chapter III.—Myopia.

Concave Lenses.—Before proceeding to the consideration of Myopia, it will be well for us to glance at some of the properties of concave lenses; and, in order to simplify the subject, we will confine

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1st. The pupil contracts; 2nd. The pupillary edge of the iris moves forward; 3rd. The peripheral portion of the iris moves backwards; 4th. The anterior surface of the lens becomes more convex (arched); 5th. The lens does not change its position; 6th. The cornea retains the same degree of curvature.

ourselves to equi-concave lenses. An equi-concave lens is bounded by two surfaces, which are portions of the concave side of two circles which have equal radii.

FIG. 9.

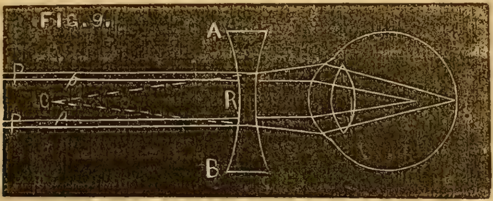

Fig. 9. A, B, one of the concave surfaces of the lens. C is the centre of curvature, and C, R the radius of curvature. When parallel rays, P, P, strike one surface of the lens, they have a divergence upon leaving the second surface of the lens, as if they proceeded from the centre of curvature, C, which, in an equi-concave lens, is also the principal focus of the lens. C, R, is the focal length of the lens. In a convex lens, the focus is measured *behind* the lens; in a concave lens, it is measured *in front* of it. If we call the focus of the convex lens positive, we must call the focus of the concave lens negative. When parallel rays of light fall upon a convex lens, they are converged to a focus. When they fall upon a concave lens, they are made to diverge. A convex lens enlarges, and a concave diminishes the apparent size of objects. The focal length of a convex lens is measured behind; and that of a concave lens, in front of the lens. They are, therefore, entirely opposite in all their properties; and, for this reason, a convex lens is called a positive lens; and a concave one, a negative lens. Or, shorter still, they are indicated by the plus (+) and minus (—), algebraic symbols; thus, + 5, and — 5; or, $+\frac{1}{5}$, and $-\frac{1}{5}$. To ascertain the focal length of a concave lens, we ascertain what convex lens it will neutralize.

1. In a myopic eye, parallel rays, as well as those that have a certain degree of divergence, are focussed *in front* of the retina; and, the inverted image of distant objects being formed in the same position, the picture upon the retina will be ill-defined, and vision for distant object consequently indistinct.

Patients with myopia complain that, although their vision for near objects is perfect, they cannot see objects at a distance with any distinctness. They can read the smallest type, when brought near the eyes, even better than persons with normal vision, but they are not able to recognize their friends at a distance of fifteen or twenty feet.

In order to enable such persons to see distinctly at a distance, it is necessary for them to wear concave spectacles of such a strength, that the parallel rays from distant objects may have such a degree of divergence, that, falling upon the myopic eye, they may form a focus upon the retina. Theoretically, we should prescribe concave glasses of such a strength that their focus will correspond with the patient's "far" point. Thus, if the "far" point be at 12 inches, we should prescribe — 12, as a twelve inch concave lens, placed before such an eye, will give parallel rays from distant objects the same degree of divergence as if they proceeded from the "far" point of the eye; namely, at 12 inches from the eye. Thus, in Fig. 9, P. P. represent parallel rays falling upon the concave lens, A. B.; they are made to diverge, as if coming from the focus, C., and falling upon the eye divergingly, they are focussed upon the retina at F. Practically, however, we would find that — 12 would be rather too strong, and that — 15, or — 16 would probably answer better. As a rule, the weakest glasses should be worn that will enable the patient to see distant objects with distinctness.

In testing the degree of myopia, we use a series of test types that are so constructed that No. I (smallest) can be distinctly seen and read by a person having normal vision, at a distance of 1 foot; No. II, at 2 feet; No. V, at 5 feet; No. XX, at 20 feet; and so on. A specimen of these types will be annexed to this paper. The types are also used in testing the acuteness of vision in Presbyopia, Hypermetropia, Amblyopia, &c.

2. In determining the degree of myopia in any case, we ascertain the greatest distance at which No. I test types can be read distinctly; if at 10 inches, the "far" point will be at 10 inches, and the myopia would be called $\frac{1}{10}$; if at 6 inches, the myopia would be called $\frac{1}{6}$. From this we can, as stated above, get a proximate knowledge of the strength of the concave lens necessary to relieve the myopia.

3. A myopic eye, when in a state of rest, is adjusted for diverging rays. To enable such an eye to see distant objects, that is, to bring parallel rays to a focus on the retina, it is necessary to give these parallel rays a preliminary degree of divergence by the interposition of the proper concave lens.

4. Myopia can be distinguished from every other defect of vision, by the fact that concave glasses improve vision for distant objects. If we have no concave glasses convenient, we can diagnose it from Amphyopia, (insensibility of the retina) by the following ready method:—A person with normal vision can read distinctly, No. I test type at 12 inches, and even a little farther. We will suppose that a patient's vision is so impaired, that he can only read No. II at 6 inches; if he is *not* also myopic, he can also read No. IV at 12 inches, or No. LX at 180 inches—that is at 15 feet. However impaired then a person's vision may be, unless he be also myopic, he can see as well proportionately, at one distance as at another. On the contrary, a person with myopia, say $\frac{1}{6}$, can see the smallest type (much smaller than No. I,) at 6 inches, but he cannot see No. II, or even No. V, at 12 inches.

This disease is often hereditary. Over exertion of the eyes upon near objects at the age of puberty, (about 14 or 15) is a very frequent cause of myopia.

Short-sighted persons often inquire if we would advise the use of spectacles. There can be no objection to wearing glasses that will enable them to see distant objects; for their eyes are thus changed to normal ones, but as most persons use their eyes much more frequently upon near than upon distant objects; the glasses should be no stronger than necessary. Some contend, however, that short-sighted persons should dispense with glasses for reading, writing, &c. Prof. Donders, however, recommends their use for this purpose, for the following reasons:—

1st. "Because strong convergence of the optic axes is necessarily paired with tension of the accommodation. The latter is an associated action, not arising from the mechanism of the convergence, but existing within the eye itself, and may consequently easily lead to an increase of the myopia. Besides this, the pressure of the muscles upon the eye ball appears to be greater when the optic axes are convergent, than when they are parallel, and this increase of pressure cannot but tend to give rise to the development of posterior staphyloma.

2d. "On account of the habit which short-sighted persons have of bending their head forwards during reading or writing. This must cause an increased flow of blood to the eye, and an increased tension within the eye itself. Owing to this development of sclerotico—choroiditis posterior, effusions of blood and detachment of the retina, which are so apt to occur in short-sighted persons, are undoubtedly greatly promoted. For this reason, we should always tell these patients to read with their head well thrown back, and to write at a sloping desk. But it may, on the other hand, be urged that it is just in looking at near objects that myopic persons have an advantage, for they can see them remarkably distinctly. And the great danger is, that after reading for a short time with spectacles, the patient, on getting somewhat fatigued will, instead of laying the book aside, approach it nearer to the eye, in order to gain greater retinal images, and thus strain and tax his power of accommodation too much. If we, for instance, give a patient whose far point lies at 8 inches, a pair of spectacles which enable him to read at 12 inches, he will, if not very careful, after a short time almost insensibly bring the book nearer to his eyes, and thus have to make use of a greater amount of accommodation. If he does this frequently, he will soon increase his myopia. The greater the range of accommodation the less harm will spectacles do, and *vice versâ*. Spectacles may also be used for near objects in those cases of myopia in which asthenopia (depending upon insufficiency of the internal recti muscles) shows itself as soon as the patient has read or worked at near objects for a short time. Whilst these forms of myopia may be furnished with spectacles for near objects, it is very dangerous to permit their use in patients whose range of accommodation is very limited, and who, moreover, suffer perhaps from such an amount of amblyopia (generally depending upon sclerotico—choroiditis posterior) that they cannot read No. 4 or 5 Jäger even with the most accurately chosen glasses. Such patients will bring the object very close to the eye, in order to obtain large retinal images, the accommodation will be greatly strained, the intra-ocular tension be increased, and great mischief will be sure to ensue. If there is much amblyopia, spectacles should not be permitted at all for near objects."[*]

In cases where the myopia is extreme, there usually co-exists posterior staphyloma of the sclerotic. Von Græfe says it is present in all cases of myopia where the "far" point is less than five inches; the myopia being less than $\frac{1}{5}$. Out of sixty cases of myopia examined by J. Z. Laurence, forty-four had posterior staphyloma.

The presence of this disease can be easily diagnosed with the ophthalmoscope. (See Hulke or Zander on the ophthalmoscope.)

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[*] Mr. J. Z. Laurence, of London, recommends that deeply concave lenses be *tinted*, in order to obviate their "dazzling" effect.—(Med. Times and Gazette, Oct. 22nd, 1864.)

Posterior staphyloma is a serious complication in myopia, as the sensibility of the retina becomes more or less impaired in the position of the bulging of the selerotic, and in some cases the retina becomes detached from the choroid. It is the existence of this disease that prevents improvement in cases of myopia, as the eye becomes flattened with advancing age.

Donders considers that in myopia, the antero-posterior diameter is alone at fault; that is, it is too much elongated, and that the cornea and crystaline lens have usually a normal curvature.

The characteristics of a myopic eye, are*

1st. Parallel rays are focussed in front of the retina.

2nd. The "far" point is at a definite distance and positive.

3rd. When the eye is in a state of rest it is adapted for divergent rays.

4th. Concave glasses improve vision.

Chapter IV.—Hypermetropia.

You will remember that when a normal eye is in a state of rest, and directed to a distant object, parallel rays are brought to a focus upon the retina, and that when a myopic eye is in a state of rest, parallel rays are brought to a focus in front of the retina. When, however, a hyperemtropic eye is in a state of rest, parallel rays would (if continued) form a focus behind the retina. Hypermetropia is, therefore, the reverse of myopia. In myopia, the refractive power of the eye is excessive, and in hypermetropia it is not strong enough. When the accommodation of a myopic eye is paralysed, it has the power of focussing none but diverging rays upon the retina, but a hypermetropic eye under the same circumstances can focus only converging rays upon the retina. The "far" point of a myopic eye is at a definite distance and positive, but the "far" point of a hypermetropic eye is at a definite distance and negative. Concave glasses improve the vision for a myopic eye, and convex for a hypermotropic one.

This is an affection which has received very little attention until within the last ten years. It was indeed noticed by Dr. McKenzie of Glasgow, in 1841, but it was not until about five years ago that

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* From Donders' system of classification.

Prof. Donders, of Utrecht, from his elaborate researches on this subject, first pointed out how common this affection is, and how frequently it is the sole cause of that peculiar weakness of sight (formerly so little understood) called asthenopia.

Donders believes that this condition of the eye depends more upon a shortening of the antero-posterior diameter of the eye, than upon a too low degree of its refractive power; that the cornea and crystaline lens have a normal degree of curvature, and that parallel rays would form a focus at the normal distance behind the lens, were the retina far enough back to receive it.

A very good illustration of a hypermetropic eye is one in which the crystaline lens has been removed in the operation for cataract. To enable such an eye to see distinctly, even distant objects, it is necessary to place in front of it a strong convex lens of about four inches focus, called a cataract glass. The eye having too low a refractive power to converge rays to a focus, on the retina, it is necessary to give rays falling upon the eye, a preliminary degree of convergence; the eye having sufficient power to complete their refraction to a point upon the retina. We do the same thing in relieving cases of hypermetrophia.

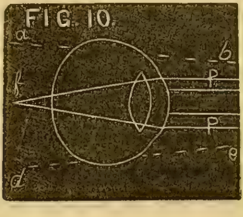
FIG. 10.

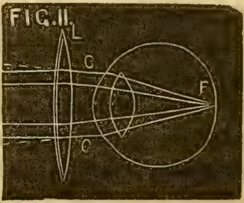
FIG. 11.

Fig. 10 represents a hypermetropic eye in a state of rest. P P are parallel rays which are focussed behind the retina at f. L, Fig. 11, is a convex lens which changes the parallel rays to convergent ones, at c, c, as if they came from the direction *a b* and *d e*, which again are refracted by the eye, and brought to a focus upon the retina at F.

When a hypermetropic eye is in a state of rest, and directed to distant objects, it is adjusted for convergent rays; images upon the retina will consequently be ill defined, and vision will be indistinct. To remedy this, it is necessary for the eye to increase its refractive power by increasing the antero-posterio diameter of the crystaline lens, so as to bring parallel rays to a focus on the retina.

When a person with hypermetropia, attempts to read or write, or accommodate his eyes to short distances, it is necessary for him to tax his accommodation to its utmost extent, in order to bring the diverging rays to a focus on the retina. This excessive effort at accommodating the eye for short distances, can not be kept up for more than a few minutes, when the ciliary muscle begins to relax,—the "near" point commences to receed, and (if he is reading) the letters become indistinct. The eye also feels fatigued, and other symptoms arise which will be referred to when speaking of Asthenopia.

Diagnosis.—When we suspect a patient has hypermetropia, we test his eyes as follows :—We place a series of test-types, No. xv., xx., xxx., &c., at a distance of about 20 feet. If he can read No. xv. or xx. at this distance, his acuteness of vision is normal. We then try his vision with weak convex glasses, say No. 50, and if he can read the same type, at the same distance, we try successively No. 40, 36, 30, 24, &c., until we reach the glasses that render the test type indistinct at that distance. Some persons may possibly be able to relax their accommodation so as to see as well at a distance, with convex 50 lenses, as without them ; and not be hypermetropic ; it would, however, be very strong presumptive evidence of its presence ; and if, in addition, the patient complain of the symptoms of Asthenopia, we would be generally safe in pronouncing it a case of hypermetropia. The shorter the focus of the lens he can use, the stronger is the presumptive evidence of the disease.

Again, if another patient be tested with the same type, at the same distance, and we find that he can not read a smaller type than No. XL. at 20 feet without spectacles, and that he can read No. xv. or xx. with convex glasses, say + 10 or + 12, his would be called a case of hypermetropia *absolute.*

In order, however, to test accurately the degree of hypermetropia in any case, it is necessary to neutralize one element in the refractive power of the eye; namely, the power of accommodation. In most cases of hypermetropia, particularly in young subjects, the accommodation of the eye is so constantly exercised, even when directed to distant objects, that it is quite impossible for them, by any effort of their own, to completely relax that accommodation. I related in a former chapter, the case of a patient who had lost the power of accommodating his eye to different distances. As the refraction of his eye was normal, parallel rays were brought to a focus upon the retina, and vision for distant objects remained perfect.

Had his eye been hypermetropic, parallel rays would not have been sufficiently converged by the refractive power of the eye, to form a focus upon the retina; vision would, consequently, have been indistinct. By placing, however, the proper convex lens in front of such an eye, the requisite preliminary convergence would be given to the rays, to enable the eye, with its low refractive power, to focus these rays upon the retina, and thus render vision distinct.

The lens used in such a case would indicate the degree of hypermetropia. If the lens were a + 15 inch, the hypermetropia would equal $\frac{1}{15}$ if a + 10, the hypermetropia would be $\frac{1}{10}$, and so forth.

We have, however, the means of temporarily producing this condition of the eye by artificial means. By applying a four grain solution of atropine to the eye, within two hours the action of the ciliary muscle will be completely paralysed. A solution of one grain of atropine to an ounce of pure water (also a solution of the extract of belladonna) will dilate the pupil widely, and in some cases, will render the eye slightly presbyopic, but it will not paralyse the accommodation.

If we test, in this manner, the case of suspected hypermetropia mentioned above, and find that after his accommodation is paralysed, he is not able to read No. xxx. even with + 50, and that the only glass with which he can read No. xv. and No. xx. at 20 feet is + 20; his hypermetropia is therefore $\frac{1}{20}$. But as he could see as well with + 50 as without them, before his accommodation was paralysed; he had a manifest hypermetropia of $\frac{1}{50}$. The difference between his total hypermetropia and his manifest hypermetropia will give the amount of the *latent* hypermetropia, which he overcame with the exercise of his accommodation, namely, $\frac{1}{33\frac{1}{3}}$, thus $\frac{1}{20} - \frac{1}{50} = \frac{1}{33\frac{1}{3}}$.[*]

Asthenopia, according to Donders, depends almost invariably on hypermetropia. He describes it as follows: "The power of vision is usually acute,—and nevertheless, in reading, writing, and other close work, especially by artificial light, or in a gloomy place, the objects after a short time, become indistinct and confused, and a feeling of fatigue and tension comes on in, and especially above the eyes, necessitating a suspension of work. The person affected now often involuntarily closes his eyes, and rubs his hand over the forehead and eyelids. After some moments rest, he once more sees distinctly, but the same phenomena are again developed more rapidly than before."

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[*] Hypermetropia can easily be diagnosed with the ophthalmoscope.

According to my own experience with these cases, the above description corresponds very closely with the description that most patients give of their symptoms. Some give more prominence to the neuralgic pains which they experience in and around the eye, and in some cases extending to the back of the head. I was consulted, about a year ago, by a lady from the town of Simcoe, C.W., who had all these symptoms in the most aggravated form. If she attempted to read even one line, it gave her so much pain in her eyes and forehead that, for several years, she had scarcely dared to even raise the lid of a book. She was unable to keep her eyes upon any one object for more than an instant at a time, without causing her pain. Others, again, do not speak of any pain or fatigue of the eye ; but that, after reading a short time, the letters become indistinct, so that they are obliged to stop or look away at something distant, or close the eyes for a short time, when they can again proceed, the same symptoms recurring.

In regard to the *prognosis* in hypermitropia, Donders thinks that when it is once developed it never gives way. All the inconvenience of the accompanying Asthenopia can be relieved by wearing the proper glasses to relieve the hypermetropia ; but the cause, namely (in most cases), a congenital flattening of the eye-ball from before, backwards, will probably remain through life.

As age advances, the "near" point recedes from the eye, as in a normal eye, so that in time it becomes complicated with presbyopia.

Treatment.—In order to correct this optical defect, it is necessary for the patient to wear a pair of convex spectacles of sufficient strength to enable him to see distant objects distinctly, without any effort of the accomodation. In cases where the hypermetropia is absolute, and the patients are not able to see distinctly at any distance, they can, approximately, by trial, select the glasses that will remedy the low degree of refraction of their eyes. But, in all other cases, it is necessary to paralyse the accomodation, and test with lenses of different strength, in order accurately to ascertain the degree of hypermetropia. When we ascertain this fact, we also know the number of the glasses that we must prescribe for them. The effect of the atropine usually lasts about a week, after which the patient can commence wearing glasses. Before, however, he use the spectacles that he is to wear permanently, his accomodation must first be gradually relaxed by the use of weaker lenses. Donders' rule is to prescribe first that glass that will neutralize his manifest hypermetropia, and $\frac{1}{4}$ of his latent hypermetropia, and every two or three weeks change them for a stronger pair, as he becomes accustomed to their use, until the glasses are reached that we found to be necessary to correct his hypermetropia. Thus, if a patient has a total amount of hypermetropia equal to $\frac{1}{10}$, and a manifest hypermetropia of $\frac{1}{30}$, his latent hypermetropia ($\frac{1}{10} - \frac{1}{30} = \frac{1}{15}$), would equal $\frac{1}{15}$; one fourth of $\frac{1}{15}$ is $\frac{1}{60}$; this, added to $\frac{1}{30}$ ($\frac{1}{30} + \frac{1}{60} = \frac{3}{60} = \frac{1}{20}$), equals $\frac{1}{20}$. We would therefore prescribe, at first, 20 inch convex spectacles, which we would afterwards change successively for + 18, + 16, + 14, &c., until he has so relaxed his accomodation that he can, with ease, wear + 10. It will not be until he becomes accustomed to this last pair that all his symptoms of Asthenopia will disappear.

Strabismus.—Prof Donders was the first to direct attentlon to the fact, that nearly all cases of convergent strabismus arise from the presence of hypermetropia. We know that when both eyes are directed to a near object, they are very much converged,—the optic axes cross at the point to which they are directed. If one eye be covered, and the opposite eye be accommodated for its "near" point, the convered eye will be found to be very decidedly converged towards the nose,—to have, in fact, a temporary convergent squint. This arises from the constant association of the act of accommodating the eye for short distances, with the act of contracting the internal recti muscles. The hypermetropic, however, being obliged to exert the accommodation of their eyes, even when looking at distant objects, it is easy to understand that they would be inclined to contract their internal recti-muscles unduly, so as to increase this power of accommodation. This converges the eyes to a point at a nearer distance than the object looked at, and causes one ot the eyes to turn inwards, while the other is fixed upon the object. When, therefore, they wish to see distinctly with one eye, they instinctively turn in the other. At first the convergent strabismus is seen occasionally only, and in this stage may be prevented by using the proper spectacles to correct the hypermetrophia. After the squint has existed sometime, it becomes confirmed and cannot be cured without an operation.

If the convergence exceeds three lines, a partial tenotomy, upon each eye, should be performed, and the effect controlled by a conjunctival suture, by which means we have the power of regulating our operation, in proportion to the effect we wish to produce.

When Strabismus shows itself in childhood, it should be treated without delay, for, if not corrected, the vision of the "cross-eye" will very soon become impaired.

To get the full benefit of spectacles, in cases of hypermetropia, they should be used both on the street, and at church, as well as when reading or writing,—in fact whenever the eyes are used.

The characteristics of a hypermetropic eye then are :

1st. Parallel rays form a focus behind the retina.

2nd. The "far" point is at an definite distance and negative.

3rd. The eye, in a state of rost, is adjusted for convergent rays.

4th. Convex glasses improve vision.

5th. This affection is usually accompanied by symptoms of Asthenopia and Amblyopia, and frequently by convergent strabismus.

Chapter V.—Presbyopia.

This affection usually develops itself between the ages of 40 and 45. Most persons at this age, although previously enjoying excellent vision, complain that their sight, particularly in the evening, is beginning to fail for near objects, as small print, &c., although they can see distant objects as well as ever.

In reading they will hold the book or paper at nearly arm's length and perhaps bring the lamp almost between their eyes and the page. Reading in this manner soon fatigues them, and they are obliged frequently to rest,—or to resort to spectacles.

In childhood, when the vision is normal, the "near" point is from 3½ to 4 inches from the eye, and the "far" point at an unlimited distance ; that is, we can see objects distinctly as near as from 3½ to 4 inches from the eye, and we can see objects clearly (the size being in proportion to the distance) from that to an indefinite distance. As age advances the "near" point recedes. At the age of 40 the "near" point is about eight inches from the eyes. When the "near" point recedes to a greater distance than 8 inches, Donders calls it a case of presbyopia ; Laurence, however, thinks that it should not be called presbyopia unless the "near" point is at least 10 inches from the eye.

Presbyopia, then, is not an optical defect of the nature of myopia or hypermetropia, but is simply a lessening of the accommodative power of the eye.

It is supposed to depend upon, or to be caused by, the crystaline lens becoming hardened as age advances, so that it does not yield sufficiently to the contraction of the ciliary muscle.

In a case of pure presbyopia where, for instance, the "near" point is 12 inches from the eye, vision will remain normal for all points beyond that distance. When the "near" point is 12 inches distant, and the "far" point at an infinite distance, the accommodation is only $\frac{1}{12}$. Taking eight inches as the normal "near" point, $\frac{1}{8}$ would represent the normal accommodation. Deducting $\frac{1}{12}$ from $\frac{1}{8}$ gives the degree of presbyopia thus: $\frac{1}{8} - \frac{1}{12} = \frac{1}{24}$. The degree of presbyopia in this case would then be $\frac{1}{24}$. This fraction $\frac{1}{24}$ also represents the strength of the glasses necessary to correct the presbyopia, namely 24 inch convex. Practically, we would probably find that a pair of 30 inch convex would answer better, as the weakest glass that can be worn with comfort, is the one that should be prescribed. Again, if a person's "near" point be at 16 inches, his presbyopia ($\frac{1}{8} - \frac{1}{16} = \frac{1}{16}$) will be $\frac{1}{16}$, and a 16 inch convex lens would enable him to read at 8 inches.

"There can be no question as to the advisability and necessity of affording far-sighted persons the use of spectacles. They should be furnished with them as soon as they are in the slightest degree annoyed or inconvenienced by the presbyopia. Some medical men think that presbyopic patients should do without spectacles as long as possible, for fear the eye should, even at an early period, get so used to them as soon to find them indispensable. This is, however, an error, for if such persons are permitted to work without glasses, we observe that the presbyopia soon rapidly increases."*

If, however, we call all cases presbyopia, where the "near" point recedes to a greater distance than eight inches from the eye, it will follow that we may have presbyopia in cases of myopia and hypermetropia. If a person's far point be at 20 inches from the eye he would be called *near-sighted* and if his near point recedes to 10 inches from the eye, he would be also *far-sighted.*

In some persons, as age advances, the "far" point also recedes so as to render the person hypermetropic; this form of hypermetropia seldom exceeds $\frac{1}{24}$. When a person has both hypermetropia and prebyopia, it is necessary for him to use a stronger pair of glasses for reading, &c., than for ordinary use. If a person for instance, wears a pair of 18 inch convex spectacles to correct a hypermetropia of $\frac{1}{18}$, and as age advances his "near" point recedes to 12 inches, even with the addition of his glasses, it will be necessary for him to wear, for reading, a pair of glasses having a focus of about 10½ inches. Thus $\frac{1}{8} - \frac{1}{12} = \frac{1}{24}$ = presbyopia, this added to the lens to correct his hypermetropia, ($\frac{1}{18} + \frac{1}{24} = \frac{1}{10\frac{1}{2}}$ nearly) equals 10½ nearly.

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* J. Soelberg Wells.

In the very aged, it is necessary to prescribe glasses, that will enable them to read at 5 or 7 inches from the eye, as their vision is usually somewhat impaired.

The following table constructed by Dr. Kitchener may give a general idea of the glasses required at different periods of life when the presbyopia is unaccompanied by hypermetropia or amblyopia.

At	40	years,—	36	inch	focus.	At	70	years,—	12	inch	focus.
"	45	"	30	"	"	"	75	"	10	"	"
"	50	"	24	"	"	"	80	"	9	"	"
"	55	"	20	"	"	"	85	"	8	"	"
"	58	"	18	"	"	"	90	"	7	"	"
"	60	"	16	"	"	"	100	"	6	"	"
"	65	"	14	"	"						

Prof. Donders thinks that when there is no hypermetropia present we should generally advise those glasses to be worn that will enable the person to read distinctly No. I (smallest) test type at a distance of 12 inches.

There is an optical defect of the eye that is occasionally met with called astigmatism (from *a* and *στίγμα*) in which horizontal and vertical lines are not brought to a focus at the same distance behind the crystaline lens. It is relieved by glasses specially ground for each case, these glasses are cylindrical. I have seen but one case of astigmatism.

A very comprehensive article on this subject appears in the Medical Times and Gazette, Nov., 1864, from the pen of J. Zachariah Laurence, M.B., of London.

The paralysis of the accommodation of the eye I have already referred to in a case on page 14.

SPECIMENS OF JÄGER'S TEST TYPES.

No. I.—Brilliant, omitted for want of type.

No. II.—Pearl.

A person with normal vision should be able to read No. II at any distance from eight inches to two feet from the eyes.

temperance was virtue. They wrought with cheerfulness on days of labour; but observed festivals as intervals of idleness and pleasure. They kept up the Christmas carol, sent true-love knots on Valentine morning, eat pancakes on Shrove-tide, shewed their wit on the first of April, and religiously cracked nuts on Michaelmus eve.

No. III.—Nonpareil.

Being apprised of our approach, the whole neighbourhood came out to meet their minister dressed in their fine cloths, and preceded by a pipe and tabor; a feast also was provided for our reception, at which we sat cheerfully down; and what the conversation wanted in wit

No. VI.—Bourgeois.

was made up in laughter. Our little habitation was situated at the foot of a sloping hill, sheltered with a beautiful underwood behind, and pratt-

No. VIII.—Small Pica.

ling river before; on one side a meadow, on the other a green. My farm consisted of about twenty acres of excellent land,

No. X.—Pica.

having given a hundred pounds for my predecessor's good will. Nothing could exceed the neatness of my

No. XII.—Great Primer.

little enclosure; the elms and hedge-rows appearing with an inexpressible

No. XVI.—2-line Great Primer.

and was covered with

Cannon. No. XX.—Snellen.

thatch, which

4-*line Roman. No. XXX.—Snellen.*

gave it an

8-*line Roman. No. XL.—Snellen.*

air of

SOME THOUGHTS ON CLASSIFICATION IN RELATION TO ORGANISED BEINGS.

BY REV. WILLIAM HINCKS, F.L.S., ETC.,

I propose in these few remarks first to touch upon the general principles of all classification and then to offer some observations on the classification of organised beings, with a view to a truly natural and instructive method.

Since classification consists in physically or mentally putting together objects or subjects of thought in groups according to observed resemblances, it seems desirable to inquire in the first place what is the real meaning of the terms *resemblance, similarity, likeness.* It is obvious enough that these terms are not applicable to single sensations or simple ideas. If a single sensation or a simple idea recur in differing circumstances of time or place it is recognised as being *the same* which had formerly occurred. What we affirm of it is not resemblance, but identity, and every other distinct sensation or idea is different from it. The states of mind being simple and indivisible, two of them must either be the same repeated, or different. Similarity is likeness in some particulars or to a certain extent without complete identity, and therefore necessarily connotes divisibility into parts or complexity of nature. Our knowledge of what we call an external object consists in a certain set of sensations, uniformly arising from what we express by its presence, and connected together in our minds as shown by experience always to be derivable from it. The remembrance or thought of this object in the mind when it is no longer present is a complex state consisting of the separate remembrances or revivals of the various sensations received from the object, associated together from their having been received together, and that as often as the object was offered to the senses. Now suppose the mind to be conscious, simultaneously or in immediate succession, of two or more objects, each having its own qualities, or in other words, producing its own cluster of sensations, if any one distinct sensation should be alike in both or all of them, this common part in the respective clusters of sensations or correspondent ideas will associate together the separate clusters as having something common, which is precisely what we mean when we affirm resemblance or likeness of objects. It is possible that several objects notwithstanding abundant differences may agree together in several points which, of course, makes the resemblance stronger, and we can conceive of all degrees, from correspondence in one element only, up to such an agreement in all particulars as would constitute sameness, the objects differing only in time and place of being offered to the senses. We thus see how it is that single sensations or simple ideas, occurring at different times, may be the same or different; but no resemblance can be predicated of those that differ, whilst as *objects* may be made up of various parts and may cause various sensations, it is therefore possible that some part or some one or more sensations may be the same, as a part or some sensations belonging to a different object causing the two to resemble each other more or less. The mind which is conscious of the sensations, if they have much vividness or direct relation to our enjoyment or suffering, necessarily becomes conscious also of the resemblance, and associating together the objects by what is common to them, considers them together, and if occasion should arise, language applies to them a common name. Their differences are not overlooked; they are not supposed to be *the same*, but they resemble one another in certain points, which engage our attention, there being sameness so far as these are concerned. Generalisation is no special power of the mind, but attending to, and if useful, naming what is common in several objects or complex ideas: classification is systematic generalisation, by the mind desiring to know the resemblances and differences of certain groups of objects which engage its attention. With many kinds of objects all that is needful or useful is easily attained, and if even there are resemblances in different points which allow of different combinations of the same objects, yet which method we select may be either unimportant, or may depend on the special purpose we have in view at the moment, as in a large library, where arrangement of the books according to their subjects would best assist the general student, but for some special purposes resemblance in language, in the size of the volume, or in the mode of binding might be employed, and each of these might be a good classification in reference to the purpose of him who thus combined them, all being founded upon actual resemblances; nor could any one of them be justly said to be more *natural* than the other, each proceeding on one definite character and suiting the convenience of him who uses it. When first the study of organised nature was commenced, all that was attempted was to collect together the various descriptive notices of objects observed, as they occurred in different authors, and put them in a form to be conveniently referred to, and for this purpose an alphabetical arrangement of the names employed would be first thought of, as enabling any who heard a name to look what had been said of it and by whom it had been employed; this plan, however, could not long afford satisfaction. The vastness of the subject makes it necessary to reduce the objects into large classes, by means of their most general resemblances, and then to break these up into more manageable groups, each marked by some common character, and the attempt once made, subdivision would be carried on with a view to the grand object of enabling the observer, by following out the points of resemblance from the more general to the more particular, to find for himself the name assigned to the object before him, and thus become acquainted with whatever was known of its history. Nothing of this kind can be accomplished by means of an alphabetical catalogue, in using which we must know the name in order to refer to the information, so that any system enabling us to trace an object to its place must be accounted a grand improvement—indeed it required much experience, and long continued efforts before this could be done with any approximation to accuracy. In the mean time new wants arose: as men contemplated the variety of organised beings passing continually under their view, they could not help perceiving resemblances which had nothing to do with the technical arrangements they employed. They felt, in spite of their systems, that objects which they had placed together, were on the whole very unlike, whilst others, far removed by their classification, impressed them with a sense of near relationship. Comparison of systems founded on different characters, as seemed best to different observers, showed the defect to be a general one, and thus arose the perception of the difference between natural and artificial methods, and the advantage of the former, provided they can be practically applied. It was in relation to the Vegetable Kingdom that this subject was first discussed, and the great Linnæus, the author of the clearest, most precise, and most practically useful system founded on resemblances in some one class of characters, formed the opinion that really natural groups could only be marked out by the sagacity of the most experienced observers, being a sort of guesses at truths incapable in the nature of things of satisfactory proof, and that such groups could not be definitely characterized, so that however interesting to the enlightened lover of nature, they could afford no aid to the student in tracing the history of the objects passing under his notice. It was with these views that he laid before his pupils his own most sagacious, and notwithstanding all the difficulties in his way, frequently successful attempts at collecting plants in natural orders, as they were called, whilst he had no doubt that his artificial system, formed chiefly on the number of the most essential parts in flowers, or some equally artificial plan, must continue to be used for tracing plants to their name and what is known of their history. His principal followers entertained the same views as to the impracticability of the natural system even after Jussieu had succeeded in giving good distinguishing characters of natural families. But what it concerns us now to inquire is, what is the distinctive quality by which a natural is to be known from an artificial system, or what we precisely mean by calling an arrangement natural? Let it be observed then that in an acknowledged artificial system each group is set apart by some single character common to all its members, and wich is chosen for the convenience with which it can be tested and applied, whilst the characteristic marks of a natural group are numerous and employed with some latitude as not being all absolutely found in all the members. All organised structures are more or less complicated, the very simplest affording various points of resemblance and difference with other structures, whilst degrees of complication themselves afford valuable assistance in grouping; but to give our studies the most interesting and instructive character, we must find out what kind of particulars are most essential in respect to living structures, what is the apparent meaning in respect to the general condition of the organism of differences observable between one and another, and with what kind of variations, or in regard to what class of circumstances the elevation or depression of the organism in the scale of being is most specially connected. If we could not obtain some clear conception of what is common to all living organisms, and enumerate the several distinct kinds of action or of progressive change by which the condition of all beings is made to be what it is perceived to be, we should have no foundation for any better classification of objects than might be formed by the arbitrary choice of any obvious particular of agreement and difference which might assist us in distinguishing and remembering the objects, but could answer no higher purpose. Hence, until life had been so studied that we could see what is common to the whole and to extensive sections of organised beings, could distinguish essential functions and different modes of performing them, and form rules for throwing classes of organisms into series ranging from the lowest to the highest, we could not possess any means for forming a natural classification which should be the expression of the real plan of nature, the actual relations of all beings to each other and to the system of the universe. If there were really no sufficient marks of an harmonious order and general plan in nature; if organised beings were found to be in a state of transition from one form and condition to another, and vital functions were performed in different ways according to changing circumstances, then indeed the pursuit of natural systems of arrangement would be vain and useless, and we might as well be content with any plan, however artificial, which would assist us to record and apply our observations on the objects around us. But we are authorised to hope for better things: there are great natural divisions indubitably established as expressing, not human contrivances for assisting study, but natural associations of objects whose real connection is clearly perceived by the mind which has been brought to the knowledge of the actual condition of things, and as we go down to lesser groups we find that the more minutely we have studied their structure and their life history, the more readily and confidently can we associate the objects, by means of what is common to them, setting aside objects which imitate them analogically or merely externally, but have no conformity in the points which manifest real affinity. If, in addition to an acquaintance with the varieties of external form and aspect in all organised beings, we knew all the modifications of their internal structure with the exact bearing of each on the performance of the vital functions, and the wants and habits of the creature; and if we farther had traced the progress of each organism from its origin to the close of a life not interrupted by accident or violence—supposing that we had comprehension of mind to embrace and duly apply this various knowledge, our association of the objects according as their agreements and differences related to points the most important and the most numerous would produce a perfect natural system ot organised beings, where the student in becoming acquainted with the classification, would, at the same time, learn the real nature and condition of the objects, and the generalisations set before us would enable us with certainty to trace each object to its place in the system, whilst, at the same time, conveying to us the best information respecting its structure, relations, and mode of existence. Physiological science combined with observation of external appearance and habits of life, forms the solid foundation for all good classification. Some good use has already been made, and may further be made of the knowledge already attained, but the road to improvement opening to us the hope of better things in future is to be sought in the cautious investigation and faithful record of facts observed in the fields, woods, and waters, or laid open by the dissector's knife or by the wonderful power of the microscope. According to their genius, their preparation and their personal circumstances and habits, it belongs to some men to collect together further materials; to others to arrange and combine these, incorporating them with those previously accumulated and making such new distributions as increasing knowledge demands; but there is no lover of nature noting what he observes, who is not a useful labourer in advancing that science whose crowning success must be a good natural system, enabling us to view all organised beings in their mutual relations, to derive from their contemplation the greatest amount of pleasure and utility, and to catch at least some glimpses of the creative plan of the Divine Intelligence, in which order and harmony, beauty and wisdom, are perfectly developed.

It appears that likeness consists in the presence of one or more identical elements in composite objects or ideas—that degrees of likeness depend on the number of identical elements in proportion to the whole number of elements making up the composite whole, whether an external object or a complex idea—that degree of likeness will also be affected by the vividness or faintness of the impression of the identical part or parts in the objects compared, in reference to the other parts, which amounts to the importance we attach to the elements which are found to be identical as compared with those found to differ in the objects. The generalising process upon which all classification depends, consists in putting together objects or ideas, in consequence of perceiving in them all some common part or element which attracts our notice and is the means of our minds associating them ; good classification must therefore consist, first, in finding out in any particular objects studied, which among the various elements comprising them, most affects their condition on the whole or their relations to us, and then looking for agreements and differences in respect of such elements ; secondly, in properly noticing degrees of similarity as marked by the number of identical elements in different objects compared so as to connect together in all instances objects most like ; thirdly, in the classification of numerous objects where secondary ternary and other divisions are requisite, the primary sections are founded on agreement in fewer particulars, but those considered as most important in respect to the nature of the objects, at each step in subdivision the number of agreeing points increases, whilst the separated groups are nearer to each other and are kept apart by less decisive characters until we reach the case of a number of individual objects which being only distinguishable by particulars of time and place, or by minute circumstances which experience leads us to esteem unimportant, are accounted one species and bear all of them the same name. It is one of the most difficult questions offering to the student of nature what amount of difference in objects may be consistent with specific identity. The believer in the transmutation of organic forms settles it according to convenience, judging it to be really unimportant, whilst he who relies on the reality and permanence of specific distinctions is called upon to point out the limit beyond which incidental variation cannot proceed, and finds it a difficulty which he cannot overcome, though he thinks he sees greater difficulties in the opposite view. He conceives that certain tendencies of development in respect to some parts of structure immutably belong to the specific type, whilst others are modified by external circumstances, but he cannot point out where the limit is placed or reduce all the cases to a general law. He seems justified in pronouncing the transmutation theory unproven, and, in some points of view, unsatisfactory to the mind; but he must confess himself unable to give a plausible explanation of the known facts, according to the common notion of creation of distinct species, and is therefore unprepared to meet his adversary with a rival theory. I cannot see that it is reasonably required of the philosophical student of nature to trace the forms he examines to their origin, excepting so far as he must perceive them all to belong to a common plan, bearing the impress of supreme power, wisdom, and benevolence, and if he is determined to speculate not only on the present relations but the original production of every known type, I believe he is as yet only at the beginning of the difficulties he must encounter before he can grope his way into a clear light. But not to pursue this subject at present I pass from these preliminary considerations to offer some comments on what has been done or attempted in respect to the natural grouping of organised beings.

The distribution of them all into two great kingdoms, as animals and vegetables, was forced upon ignorant man even in his most savage condition, and is admitted by all who have thought upon the subject; and yet to explain the real points of universal resemblance in the members of each kingdom, and the differences which enable us most certainly to distinguish the two, is by no means easy. Widely as the most characteristic members of each kingdom differ from each other, it is easy to point to organisms which have been referred sometimes to one, sometimes to the other, by those who might be esteemed amongst the best judges, and the final settlement of these doubts can hardly yet be assumed—though individual naturalists may, in each case, have satisfied their own minds. In truth this is but one case of a universal law of organic nature, without due attention to which our attempts at natural grouping will always fail, that there are plans of structure consisting in the combination of various characters, all which characters are combined in the typical examples, whilst in different directions there is a gradual fading out of each of them, and intermixture of other characters so as to make the precise boundaries of a group always difficult to determine, obliging us to consider not only typical plans, but intermediate conditions, where we have to judge which of two or of several types predominates. All organized beings tend to one of two plans of development, one of which has for its end the sustentation of the individual or the race, the other intercourse with external things by means of powers of sense and motion. The former only is perceptibly manifested in the vegetable kingdom, the latter is added in the animal kingdom; but besides this great addition, little perceptible in some of the lower forms of animals, the plan of nutrition itself entirely differs in the two kingdoms and it is here that we find the best marked distinctions. Vegetables are nourished by inorganic matter, water with gases or salts dissolved in it; animals by organised substances, whether fresh or tending to decomposition, but not having returned to their elements. This is the grand real distinction, but it is at least very difficult of application in some of the lower forms.

The simplicity and uniformity of the means of nutrition in the vegetable kingdom leave us no such convenient means for distinction of forms as are found in the animal. Hence we are obliged to rely for characters on the mode and results of growth, and, to a very great extent, on the reproductive system—and it follows that there can be no real analogy between plans of classification in the two kingdoms, nor any agreement otherwise than accidental in the number of divisions produced—whilst within the animal kingdom the same variations in the tendency of development which mark the primary divisions, acting again under each secondary type produce a nearly uniform conformity in the number of divisions at each step in our progress, and a consequent analogy between all groups, larger or smaller, which occupy the same position in the order of subdivision. This may also be the case in the vegetable kingdom, but as we cannot yet characterise the tendencies upon which our great groups depend, the analogies we trace are there more slowly worked out and our progress towards a complete classification is far less satisfactory. The earliest attempts at botanical classification were, doubtless, intended to follow an order discernible in nature; but they were so rude in themselves, as well as so difficult of application, that they afforded little assistance. Right ideas of the uses, relations, and variations of the organs making up a structure, necessarily precede the just perception of resemblances and differences, and these are among the hard-earned acquisitions of modern science.

Hence Linnæus judged wisely for his time in forming a simple artificial system to assist in recording and rendering accessible the knowledge of species, the utility of which is proved by the almost universal homage paid to him by his contemporaries; but although he had no definite hope of our ever being able to define large natural groups, his sagacity discerned their existence, and he had the wisdom to perceive their importance so that even the dim view of them given in his natural families was a great progressive step. Labouring with eminent advantages of talent, learning and opportunities, Jussieu advanced to the definition of natural orders. De Candolle reduced vegetable organography to a beautiful science and clearly expounded the principles on which inquiries tending to a natural classification of plants must proceed. Other eminent men have distinguished new orders, and others (amongst whom the late Dr. Lindley stands pre-eminent) have entered on the labour of combining the so-called natural orders into larger associations capable also of being well defined. All this is progress, although there are doubtless great errors to correct and important analogies not yet perceived, but it is remarkable that after the great divisions given us by Jussieu, and now universally recognized, we have advanced by working from the species upwards, finding boundaries for genera orders and intermediate divisions, and at length for alliances, but we have never clearly perceived how it is best, primarily, to divide those great primary sections which can only be compared with the sub-kingdoms or branches of the animal kingdom and ought unquestionably to be so called. We know Jussieu's *Acotyledoneæ, Monocotyledoneæ* and *Dicotyledoneæ* to be natural divisions, suggested by several kinds of characters, and never to be neglected without confusion, but the most plausible of other suggested classes, so far as they are good, are but divisions of these, and nothing is more remarkable in the science than the want of good classes to rank under these sub-kingdoms. The results of our labours upward in the combination of species into genera, these into orders, and these again into alliances, do not yet unite in good classes under each sub-kingdom. Such for instance as the great sections or sub-classes of the Dicotyledoneæ as given by De Candolle and by Lindley, must be acknowledged not to be natural and are indeed offered as mere aids to the student. Until this gap is properly supplied Botanical classification must remain in a very unsatisfactory condition. It seems strange that of the many great men who have employed their genius in improving the science, none has yet discovered a good structural principle upon which to establish the genuine classes of what we must be allowed to call the vegetable sub-kingdoms. It is somewhat remarkable, too, that our success has been greatest with the lowest of the three, for Thallogens are certainly a class, and if we distinguish Anogens from Acrogens, by characters founded on both the nutritive and reproductive systems, which seem sufficient, guarding ourselves from the error of confounding the Ferns with Endogens on account of their imperfect vascular system, we have three natural and well defined classes of Acotyledoneæ which again subdivide into alliances and orders, in a manner, which makes the classification convey the substance of our knowledge, and afford the best aid to our minuter studies.

I must now direct your attention to the state and progress of classification in the animal kingdom. There was little that could be called progress from Aristotle to Cuvier. Linnæus' Zoological system was a very inferior one. Cuvier's improvements were founded on the study of organization in every department of the animal kingdom, and though so much has been done since he commenced his labours, correcting errors, perfecting details and extending the field of observation, his grand divisions of animals, known as sub-kingdoms or branches, are still accepted by most Zoologists with or without the addition of a fifth, which the advance of microscopical studies has in the opinion of many proved to be necessary. La Marck took as a leading division that between Vetebrate and Invetebrate animals—a real one doubtless in a certain sense, but which ignored the important fact that, any of the other divisions might, with equal propriety, have been insulated and opposed to the rest—that the difference in essential structure between Articulates and Molluscans is quite as great as that between Vertebrates and either of them. So true is this that the expression Invertebrate animals, much used since LaMarck's writings conveys a misleading and confused idea, and ought to be carefully avoided. It does not enter into my plan to criticise the schemes of particular zoologists, but rather to refer to different tendencies of thought in respect to zoological classification, and estimate their influences in leading towards a truly natural system. The great philosophical naturalist of Germany, Oken, though guided to a great degree by his extensive and accurate knowledge of structures, founded his system on a preconceived idea of what must be or ought to be, in a sort of representation of the various functions or systems of parts of man, the highest animal, amongst the lower orders, some one function predominating, according to his view, in each division. Whilst persuaded that the idea of subdividing the vital functions of the most perfect animal, and arranging groups of animals in which each predominates and gives character to the structure is too fanciful for usefulness, and that Oken has wrongly treated as leading functions, the several branches of the nutritive, whilst it is hardly true that those branches are specially represented in the divisions to which he has assigned them ; I cannot but feel that the conception of the predominance of a particular vital function in a great division of the animal kingdom, giving it its special character, is a just and noble one, and cannot fail to contribute greatly to the progress of a truly natural system.

I do not know of any principle so certainly misleading in the classification of organised beings as that of requiring that every object in a certain division should strictly conform to all its distinctions as they must be laid down in giving a general view of it. The common character represents a cluster of tendencies all clearly manifested in the most typical examples, but losing their power in remoter forms which, nevertheless, have something about them which does not permit their removal from the group. Thus is produced that shading of all natural divisions into each other and that abundance of transition forms which so conspicuously mark the order of nature. I may illustrate this remark by observing that I have noticed its being accounted a sufficient objection to Professor Owen's primary divisions of Mammals according to the development of the brain, that some which are placed in Gyrencephala do not display the gyrations which form the leading character, as for instance the small lemurs and some of the minute monkeys. Surely, however, if these animals are admitted to be most closely allied to such as do display the gyrations, and are at the same time both among the lower forms and of small size, the fading out of the character is sufficiently accounted for, and we are obliged to be content with a general characteristic, though it does not yield a rigid definition. With respect to the remainder of these great divisions, Lyencephala is supported by abundant confirmatory characters, and has hardly been called in question. As to Archencephala it would be interesting to see Professor Owen's reply to the charge of falsehood in statements which have at least the appearance of probability; but I should not willingly give up the belief that the brain of man is in some way superior to that of monkeys, and that he ought to hold a prëeminent position in a truly natural view of the animal kingdom. It is very dangerous to rely for our principles of classification on characters drawn from one function, or one mode of viewing animal structures, if we are seeking a truly natural system. We, of course, want facts collected in relation to every part of structure, and no well-authenticated facts are lost to the enlightened naturalist; but it is always to be recollected that reliance on one set of organs will mislead us if it be not the most important not yet otherwise employed, and that we are very liable to mistake adaptive modifications of structure for great organic differences. Even embryology, high as is its degree of importance, cannot safely be trusted too far, since it has led one so profoundly acquainted with its facts, and so skilful in the application of principles as Agassiz, to cut up into distinct classes the eminently natural group of fishes. His observations may be true and valuable, and may assist in determining the subdivisions of the class; but I cannot but think that he exaggerates their proper influence when he multiplies on their account the classes under the vertebriate type.

Mr. Dana's principle of Cephalisation, as a basis of classification, may perhaps be liable to a similar objection. No doubt it embodies important truth, and real assistance may be drawn from it in determining the highest structures under each type, but I cannot help thinking that it has already shown itself liable to abuse, and that so far as it is good, it only confirms what is obtained from other sources.* Very ingenious and noteworthy attempts have been made to arrange mammals according to the mode of placentation. The facts obtained are a valuable addition to science, and might be very useful in determining in a doubtful case to which of two groups an animal ought to be referred, but I must think it a great error, in that highest class of the highest sub-kingdom, which especially represents the development of the organs of sense, and the faculties which most elevate a being, to look to the reproductive system, the lowest of the separate functions of life, for the leading means of subdivision, nor does it at all appear to me that the grouping thus obtained is conformable with the best ideas of natural arrangement obtained in other ways. On the contrary, the great mammalian sections of Owen, founded on the structure of the brain, divide the whole into groups strikingly natural in their general aspect, and singularly constant in the correspondence of analagous divisions in all the great sections. One other observation I will venture upon at present: among the more remarkable modern systems must be accounted that of McLeay, and one thing remarkable about it is the rapidity with which—at least among English Naturalists—it was adopted for the time, with the greater rapidity with which it has been consigned to comparative oblivion. I cannot contend that as left by its author or by his great disciple Swainson, it is entitled to revived popularity, but I do think that it gave prominence to some just and important ideas, calculated to aid us in our progress, and I feel that it has met of late, when noticed at all, with some unjust treatment. Its better features are not only the calling attention to the difference between affinity and analogy, but the perception that the regular order of nature implies, prevailing uniformity in the number of the divisions under each type of structure, and the illustration of this principle in a great number of good examples, although many errors were committed from the necessary imperfection of a first attempt, the impossibility of one individual being minutely acquainted with all the branches, and from some false views as to the nature of the relations between the subdivisions of each natural group.

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* I cannot suppress the expression of a hope that, should this be deemed the best application of the facts, upon which it has served strongly to fix attention, respecting the concentration of important organs in the anterior portion of the body in the higher structures under each type, the expounders of the system will at least avoid certain very barbarous terminology, with which its distinguished author has burthened it.

Let us give up the fanciful notion of each natural circle returning on itself, using the circle or the pentagon merely as a convenient way of representing the corresponding tendencies under each type in their relation to its common characters, and let us express the nature of the subdivisions, not by calling them typical, subtypical and aberrant, expressions which have no useful meaning, and which cause corresponding developments of different types to occupy different positions in their respective circles, but by giving appropriate positions to each tendency of development which shall be uniformly adhered to throughout our whole system, so as to force on our attention the analogies of nature, and we may perhaps attain to a combination of the best thoughts of the German Physiophilosophers with a most convenient exposition of the relations of the parts of creation, already affording the best key to the grand plan of nature, and improved by every real addition to our knowledge of structure, provided that we cautiously avoid those errors which I have referred to in this paper, and into which very great men have often fallen. A good classification is a convenient summary of our knowledge, an artificial memory for retaining it, and keeping it in readiness for use ; an invaluable assistance in communicating it to others, and much more than all this it is the expression of the real plan of the great author of nature, enabling us to feel its beauty, and to understand the harmony which binds together the infinitely varied forms of organised beings.

It will, I hope, be perceived that in these few remarks, which appear to me useful after all that has been written, I do not attempt any general treatise on the subject, which would require a volume, and in which I could but repeat what has been well expressed by others. To those who seek the best general views, such works as "Typical forms and special ends in Creation," by Doctors M'Cosh and Dickie, and the admirable introduction by Agassiz to his "Contributions to the Natural History of the United States," cannot fail to afford much satisfaction. It can hardly be said at present that any particular zoological system decidedly prevails. The influence of particular eminent men has produced local effects, often I am persuaded very unfavourable to real progress, but the system which shall best combine all that is needed is yet to be determined, and a careful study of principles must prepare the way for its reception.

ON ERRATA RECEPTA, WRITTEN AND SPOKEN.

BY THE REV. DR. SCADDING,
HONORARY LIBRARIAN TO THE CANADIAN INSTITUTE.

(Continued from Vol. X., p. 406.*)*

V. WRONG ETYMOLOGIES AND MISPRINTS.

1. *Wrong Etymologies.*

While treating, in former papers, of vernacularisms and Anglicised foreign terms, I to some extent forestalled myself on the subject of wrong etymologies. A few miscellaneous specimens, however, remain, not hitherto taken up. These I shall, with the utmost brevity, discuss, and then pass on to the topic of "misprints."

It will be necessary, I suppose, for each successive generation to be reminded, once, that *camelo-pard,* a word moulded on the analogy of *leo-pard,* is not *camel-leopard,* a rendering which even Shelley admits, where he humorously refers to the *petite* bride of his tall friend, as

> "The milk-white Snowdonian antelope
> Matched with the cameleopard."
>
> *Letter to —, from Leghorn.*

Also, that *anomalous* has nothing to do with *nomos.*

Morea, the name acquired by the Peloponnesus in the middle ages, has been attributed to *morea,* Greek for the "mulberry," either from its shape, which somewhat resembles the leaf of the mulberry; or, from the early introduction of the mulberry into it (by Justinian, in 555). Others, again, say that it is a modification of *Romea,* a word indicative of the fact that this peninsula was a fragment of the empire of *Nova Roma.* With greater probability, however, it is deduced from the very ancient root *mor,* that is, *sea*—the Morea being that portion of the region occupied by the Sclavonians, which possessed the greatest extent of maritime coast.—The real meaning of *Oxford* is, "the Ford over the Ock," a small tributary of the Isis. "Oxford" has been poetically Latinized; or, rather, Græcised into 'Bosporus;' literally, "the oxen's crossing-place."—A celebrated street, in ancient Rome, was called the *Velabrum,* "the Awning." Becoming obscure, in the lapse of time, *velabrum* was interpreted to be a contraction of *velum aureum,* "golden veil." The mediæval inscription to be seen at the present day, near the locality, in the Church of "St. George in Velabro," is thus accounted for:—

> "Hic locus ad velum cognomine dicitur auri."

Septentrionals as we are, we may not deem alien anything that relates to the constellation from which we have our name. It will, no doubt, then, be interesting to us to learn that Prof. Max Muller, in his second series of Lectures (p. 365), is of opinion that etymologists laboured under a mistake when they interpreted 'Septentriones' as "the seven ploughing-oxen." Rather are we to believe that by 'triones' here (for which, in the sense of "ploughing-oxen," we have only the *ipse dixit* of Varro), is meant to be said 'striones,' an obsolete term for 'stars;' exhibiting, in fact, in itself, the root-element of 'star.'—As having reference to the skies, also, another item will here be in place.—A singular name, given by our English ancestors, to the Milky Way, seems to have been suggested by an etymological notion entirely wrong, and hinted at, perhaps, only in jest; as where Chaucer says, in the *House of Fame*, II.:—

> "Se, yondir, lo, the galaxie,
> The wiche men clepe the milky-way,
> For it is *white*; and some, perfay,
> Y-callen it han *Watlinge*-strete."

It is a common thing to manipulate a word until it presents to the eye the idea its sound is supposed to convey. Thus, it is likely, *uproar* is held, by many, to be expressive of the un-human, animal-like *voces naturæ*, sometimes to be heard proceeding from a tumultuous crowd. Its good Netherlandish original, *oproer*, however, is not indicative of these; but, simply, of a movement upwards—an uprising among the usually quiet multitude—what the Latins would call *insurrexio;* and the Greeks, *stasis.* (The favorite Latin term, *seditio*, is an exact synonym of *secessio:* *sēd* and sē denoting *apart;* and *itio*, "a going.") Again: it is, of course, popularly supposed that the *rose* of the useful garden watering-pot has its name from its circular rose-like form; and, sometimes, its perforations are, accordingly, to be seen arranged after a sort of "wind-rose" pattern. The conjecture is wide of the mark. Here is no allusion to a flower. Like the first syllable of the familiar *rosemary*, this *rose* is a descendant of *ros*, through the French, *roser*, *arroser*, 'to moisten, as with *dew*.' (*Nota bene*, in passing, that the rose-wood of the upholsterer has its name from its *smell*, when fresh cut). To remove latent misconceptions in regard to "straw-berry," it will be of use to say that the word is pure Anglo-Saxon. *Streow-berie* is the fruit whose plant *strews* or spreads itself.—"Straw," for the crushed and confused stalks of wheat, barley, &c., has its name from the use to which it was extensively put before the introduction of carpets for the floor. To this day, on paved streets, in front of houses where it is understood one of the inmates is sick, it is to be occasionally seen "strawed," just as it used to be, on the stone floors of ancient corridors and "halls."

The etymology of *sincere* remains *sub judice.* Let the unwary modern, then, not quote either his Calepin or his Donat. The former used to give the first syllable of the word as *syn;* and, it was argued that, in a just division of the contents of a hive, the honey *with* the comb must, in exact proportion, be distributed: it was a fraud to withhold any share of the *wax*. On the other hand, Donatus taught that this *syn* was *sin;* interpreting *sincere* as *purus sine fuco et simplex, ut mel sine cerâ.*—Linguists have now changed all that. In *-cerus* is, perhaps, involved the root-element of *cre-o,* with a reference, consequently, to the *hy-le*—the stuff of which things ultimately consist.

In the phrase, "art and mystery," an unauthorized etymology, it is to be feared, is insinuated by the *y*. It was *mistery,* anciently, and this from *ministerium;* which is, also, the French *métier*. Some, with less plausibility, will have it to be *maistery,* and *mastery;* that is, *magisterium.*—*Menial* has been, also, attributed to a Latin origin —to *mœnia,* a form of *munia*: official duties and service. But, in reality, it is the adjective of *meinie,* or *meignee,* Norman-French for a nobleman's retinue. Our *many,* when used as a noun, appears to be the same word.—It would be wrong to assign to *consanguineus* the word by which our French neighbours designate the mosquito; viz., *cousin*. The eagerness of the creature to claim a share of our blood might lead to the supposition. But *cousin,* in this sense, is from *culicinus,* a diminutive of *culex,* a gnat.—The grotesque term, *bogus,* to be heard in the United States, sounds very much like one of those slang expressions which spring up, sometimes, at Universities, and then find their way into the general circulation. Before becoming aware of Mr. Bartlett's statement, in his "Dictionary of Americanisms," to the effect that the word is a corruption of the proper name, *Borghese,* borne by a man infamous for the manufacture of counterfeit bank-notes, I had formed a theory, thus: Strabo, in the Introduction to his Geography (ii. 314), refers to Posidonius's account of the repeated attempts of a certain Eudoxus to circumnavigate Africa. The narrative of what this early Vasco de Gama did and suffered, in the kingdom of Bogus, while urging his fixed idea on the monarch of that name, is considered, by Strabo, as especially incredible. Although, in all probability, founded on sober truth, like Bruce's Abyssinian marvels, at a later date, he stigmatizes the whole as "Bergæan nonsense"—as a trumped-up traveller's tale. May not a joke among the youth of the Massachusetts' Cambridge, involving the name of the above-mentioned royal personage, have given rise to the vocable in question?

2. *Misprints.*

Every one who has had anything to do with getting written matter transferred to type, knows how hard it is to secure a perfect accuracy. Errors escape the eye of the most vigilant and of the most experienced. Such printers as the Aldi and Stephani, or as the early Elzeviers and Frobenius, being themselves enlightened connoisseurs in the learning of their respective periods, superintended with intelligence and affectionate care the sheets that issued from their presses. Their editions are consequently distinguished for a great exemption from faults. As, however, the art of printing came to be more extensively practised, and employed simply as a mechanical means of obtaining a livelihood, errors of the press multiplied exceedingly. While locomotion was difficult and postal transmission slow, infrequent and expensive, authors seldom revised the proof-sheets of their own works. The corrections were made by readers incompetent for the irksome but all-important task. A notification of errata at the beginning or close of every volume was accepted as a thing of course.

At the present day every facility exists for the securing of accuracy in typography, so far as the writings of cotemporaries are concerned. But the literary works of preceding generations have not yet been quite cleared of the defects which marred them on their first appearance in type. In the most sumptuous of our modern publications, editors have not entirely succeeded in weeding out, perhaps in every instance, they have not detected, the mistakes of the early printers.

A further-removed cause, too, of uncertainty in regard to the absolute literal accuracy of our present texts of ancient authors must be borne in mind; namely, the condition of the manuscripts which served as "copy" to the first printers. In works transmitted by writing from age to age, many were the sources of error. Centuries ago, the books of Homer were well known to have undergone interpolation extensively. The agency that could, on occasion, secure from an Oracle a convenient response, could as easily induce the insertion of an apposite clause in a codex, should the same be wanted. Solon himself, we are told, gave a colour to the right of Athens to Salamis by adducing a line, foisted in for the nonce and still continuing in the Catalogue of ships in the second book of the Iliad. But even where no reasons existed for intentional falsification now and then, the human liability to err would inevitably lead a copyist into occasional mistakes. *Homoioteleuta,* as they were called, were particularly fatal to him; that is, words of like ending catching the eye and leading to the omission of intervening matter; and then there were in all alphabets letters that were exceedingly alike, and characters used as numerical signs differenced in many minute ways, particularly likely to be misread; not to speak of intricate ligatures, obscure abbreviations, signs of contraction, sigla and symbols in general. In one or other of these points, every scribe in every place would be more or less liable to make a mistake. In a library of manuscripts gathered together from many quarters, the chances of detecting a large number of errors and a considerable variety of readings would consequently be very considerable. One other source of inexactness, too, should be remembered—the memoranda and glosses which casual readers took the liberty to make on the margin of manuscripts. These the next copier sometimes inserted in the body of the work as though they had been omissions on the part of preceding scribes. And then again, it is said that a professional scrivener would occasionally not correct his own known blunders in order that his pages might appear without erasures. With sheep-like simplicity the next copier would then make a transcript with these faults blindly continued.

There is no doubt, however, that in the mediæval monasteries, as among the Jewish copyists of an earlier date, great precautions were taken to prevent errors in manuscripts. For one thing, the scriptorium was directed to be as far as possible, isolated, and kept in a state of quietude. In the *Liber Ordinis S. Victoris Parisiensis,* we have the regulation: "Loca etiam determinata ad ejusmodi (sc. libros scribendi) opus seorsum à Conventu, tamen intra Claustrum præparanda sunt, ubi sine perturbatione et strepitu scriptores operi suo quietius intendere possint. Ubi autem sedentes et operantes, silentium diligenter servare debent, nec extra quonam otiose vagari. Nemo ad eos intrare debet, excepto Abbate et Priore et sub-priore et armario." Continuous accuracy, age after age, was also sought to be obtained by very strict injunctions on the point of correct transcription, inserted by scribes for the benefit of their successors. In the preface to Ælfric's Homilies, there is not only an "adjuration" to the copier to transcribe correctly, but a direction to copy the "adjuration" itself into the new transcript for the admonition of future scribes. In somewhat similar strain runs an exhortation at the beginning of the *Precatio* of St. Nerses (circa 1100): "Vos autem qui eam in libris transcribitis, hæc quoque exhortationis verba scribite; et qui eam scripserint, ipsimet scribantur in catalogo æternæ vitæ; et qui eam didicerint et recitaverint, misericordiam à Christo inveniant. Qui vero eam socium docuerint mercedem à Deo accipiant; et qui eam scripserint ne verbum quidem aut syllabam addant vel minuant, præter quam quod scripsimus, ne variantia fuerint exemplaria, sed similia cuncta, ubicunque scribantur."

In spite of every precaution, however, slips of the pen would occur. What with these, and errors from other causes already hinted at, there is no especial reason for wonder then, that when, on the invention of printing, the manuscript remains of the ancient literatures, Hebrew, Greek and Latin, came to be collated for the purpose of preparing texts for the press, a variety of readings in the manuscripts of the several authors was discovered.

From the Revival of Letters to the present time, it has been the anxious effort of careful critics to reconcile differences between conflicting codices, and to educe from them, by elimination and combination, the *ipsissima verba,* so far as it is practicable, of the original writers; and, as far as the principal and best-known authors of antiquity are concerned, great progress has been made towards purity of text. Through the united labours of the setters-forth of the *Editiones principes,* and the subsequent studies of German and French and British scholars—of Hermann and Brunck; of Casaubon and Brotier; of Porson and Bentley—the works of the leading poets, dramatists, historians, and orators, of Greece and Rome, now appear in a comparatively satisfactory condition. It cannot, indeed, be said that, in each class of these fathers of the literature of the civilized world, difficulties have been cleared up in an equal degree. But, it is evident that, in all of them, great advances have been made towards the very words of the respective authors. Homer and Herodotus; Æschylus and Thucydides; Plato and Aristophaues; with Horace and Livy, and Tacitus and Terence, can be read and enjoyed by the youth of the present generation, with a much less cumbrous apparatus of note and comment, than they could be by their immediate ancestors.

In *their* days, while yet "flourished" the so-called Porson-school, a critical edition of a Greek or Roman writer presented a somewhat formidable appearance. At the top of each page was the text, sparingly displayed; just one or two lines. Then came a broad belt of very dense matter, in small Roman, Italic and Greek type, abounding with strange symbols of reference to codices, and editions, and unceremonious curtailments of distinguished names. Here was the *orchesta Martis,* the arena of conflict with editors defunct and living. The gulf below was a kind of valley of decision, filled up by two narrow columns, of a height or length varying according to circumstances; built, so to speak, of paragraphs of curt and compact Latin, the vehicle of a comment usually objurgatory and defiant.

This kind of treatment of the leading writers of antiquity has now, to some extent, exhausted itself. On very many of the points long under discussion, reasonable conclusions have been come to; and the student is at last permitted to examine his author in peace, mastering the substance of the composition before him with mind undistracted by the wranglings of critical advisers.

The text of the principal writers having been thus, in a considerable degree, settled, the turn of the lesser authorities has come. The minor poets, and historians; the geographers, physicists, and grammarians, together with the series of the so-called Byzantine writers, are, probably, at this moment, as corrupt as were Thucydides or Livy, at the time of the Revival of Letters. All their productions, however, contain matter which, when read aright, is of value to him who would, in every point, rehabilitate the past. Hitherward, then, other fields being now tolerably well beaten over, it is to the general advantage that the inquisitive spirit of man should direct itself; and, it is to be hoped and expected that it will take no rest until here, also, results satisfactory to the common understanding are arrived at.

Our literature, in that large department of it which has descended to us through manuscripts, is thus, it will be seen, even to this day, still in a transition-state. Like modern society, it is the inheritor of some subtle and complex errors; but, like modern society, also, it is awake to their existence, and bent on their extinction.—The forgeries and interpolations which, at certain periods, proved so hostile to the happiness and mental freedom of men, would never have been attempted had the printing-press been in operation at the time. Such productions as the later Sibylline books, and the Decretals, attributed to Isidore of Seville, could only have gained currency through the secret contrivances of solitary scribes. When a production is genuine, but overlaid with the incrustations of time, there is nothing like putting it in the crucible of the press. It is, at once, subjected to the scrutiny of a thousand minds; and the blemish overlooked in one generation is removed in the next; until, at last, it is brought back to something like its pristine integrity.

It would not be difficult to trace, through successive editions of standard Greek and Latin authors, strange misconceptions of sense, until the destined critic appeared; who, by the change of a letter, or reconstruction of a syllable, made the truth of the passage self-evidently to flash forth. One instance, a sample of many, must suffice. Up to the time of Dindorf, the text of Pausanias (*Travels*, x. 12.) represented the Sibyl, Herophile the younger, as saying that her mother was a goddess, but that her father was an "eater of whales!"

> *Εἰμὶ δ' ἐγὼ γεγαυῖα μέσον θνητοῦ τε θεᾶς τε,*
> *Νύμφης ἀθανάτης, πατρὸς δε κητοφάγοιο.*

Learned scholia, on the place, assured the reader that several profound meanings were implied. By a very simple correction, Dindorf transformed the portentous epithet, *cetophagus*, into the very moderate and reasonable one of *sitophagus*, "eater of bread," a common poetic expression for a mortal man. In Schubart's edition (Leips., 1854.), Dindorf's emendation is incorporated in the text (*πατρὸς δ' ἐκ σιτοφάγοιο*).—In a similar manner, long-misunderstood inscriptions on coins sometimes receive a sudden clearing-up by the insertion of a letter, or the addition of a stroke. On the reverse of a coin of Carausius, the word ORIVNA was, for a time, a crux to numismatists. It was held, by some, to be the name of an otherwise unchronicled empress of British descent, the word including a Welsh element. By others, it was shewn to denote a certain deified heroine, the female correlative of Orion.—A matter-of-fact observer, however, by replacing an F at the beginning of the word, and a slight transverse line on the top of the supposed I, both of which had been worn away in the lapse of time, proved the disputed term to be simply FORTVNA, a name very common on the coins of emperors.

But, details of this kind not being readily intelligible; nor, perhaps, very generally interesting; I shall confine myself, now, during the remainder of the paper, to the notes which I have happened to make of verbal errors that have insinuated themselves into our literature, and common speech, mainly through a faulty typography.

The misprints of the class to be described produce, of course, a certain sense, and so by the negligent may, in some instances, be passed over without detection. Some errors of this kind run throughout an edition, and after misleading for a few years are discovered and corrected. Others are longer-lived—so long-lived that they acquire a prescriptive right to their existence and supersede the original and actual expressions of which they are the representatives.

Before proceeding to these rather enduring typographical inaccuracies, it may be well to notice one or two of the ephemeral sort, which sometimes startle and perhaps amuse us for a moment, but which are at once set right either mentally or by some simultaneous notification. Some of these will serve to illustrate the mode in which the more enduring faults have arisen.

Not long since, it is said, a French paper astonished the world of Paris by announcing that a certain well-known savan had lately been *dévoré* (devoured) by the Emperor. An unfortunate *v* had found its way into the box for *c*'s in the compositor's case, and had here been inadvertently selected. The intention was to state that the philosopher in question had been *decoré*—had received a "decoration" at the Imperial hand. Again: London was recently amazed to learn from one of the daily journals, that a distinguished financier was about to issue a work "On the Monkeys of all Nations." Here, an extra letter had done the mischief. The *k* should have been struck out. It was a work on the "Moneys of all nations." A telegram in a Montreal paper not many weeks ago, reported from New York that the members of a wide-spread association for the accomplishment of a supposed very important political object, had been notified by circular from the central Board that, "a point had now been attained from which they could see the *gaol* plainly before them." Here injury to the sense had been occasioned by a transposition of letters. For *gaol*, *goal* ought to have been printed. In a catalogue of "choice, useful and curious" books, put forth by Mr. J. Russell Smith, the well-known publisher of Soho Square in London, I lately noticed a certain pamphlet thus entered: "*Antimonians*—A Declaration against the Antimonians and their Doctrine of Liberty, 4to. 3s. 1644." Extended as the reader's acquaintance with human notion and opinion may be, he will not, perhaps, at once call to mind the Antimonian sub-variety. Are they partisans, he may, perhaps, mentally ask of himself, of the celebrated Valentine, author of the once well-known *Currus Triumphalis Antimonii*, who experimented with such fatal effect on the members of his own confraternity, by the too-plentiful exhibition of the metal whose name is an enduring memorial of the sad catastrophe? Not so. Two letters in different syllables have merely exchanged places. The *n* should have been where the *m* stands. They are only the old familiar Antinomians after all. The occurring of the same error twice in the same paragraph helps the impression that nothing is wrong.—It is singular to observe how in rendering the commonest names blunders will sometimes occur. A quotation from Gray's well-known "Ode on a distant prospect of Eton College" has a rather ludicrous appearance as given in Mr. Timbs' very interesting "School-days of Eminent Men," p. 218. It runs thus:

> "Say Father Thomas, for thou hast seen
> Full many a sprightly race," &c.

Some infatuation seized the compositor here to set up "Thomas" instead of "Thames." A typical mis-rendering of a proper name combined with a reduction in rank of its initial letter preverts the sense without exciting suspicion, in a couplet from the Dunciad, as given in the 1st edition of Friswell's "Familiar Words":

> "Now night descending, the proud scene was o'er,
> But liv'd in settled numbers one day more."

It should be "Settle's numbers," Pope's insinuation being (what would have been the actual fact had it not been for that very allusion) that Elkanah Settle's verses would be forgotten in a day.

The effect produced by errors of this kind is often, however, quite unsensational. The apparent sense of the words is good, and such as to give full contentment to the simple public. It seemed by no means an incredible announcement when, some months since, the papers everywhere circulated the intelligence that the Messrs. Chambers of Edinburgh, were about to issue a "History of Publishers." The subject, no doubt, struck many persons as one not devoid of interest. It turned out, however, that the forthcoming work was a "History of Peebleshire." When the readers of the *London Review*, in its January number of the present year (1866), were more than once given to understand that there had been in former times in the United States, an itinerent notability of the name of Lorenzo *Daw*, the generality of them, of course, knew no better. A very mild specimen of a correction to be seen in a recent "Little's Living Age," deserves to be here set down on account of its instructiveness to scribes : "Page 194, last line, read *green grasses* and not *green grapes*." In the preparation of copy for the press, observe what care should be taken in the execution of a double *s*. A not unfrequent erratum of "capitol" for "capital" is peculiar to the United States. The name of the national State House at Washington has confused certain writers and printers. In one of the less-distinguished United States' newspapers, I not long since noticed a reference to our own venerable town of Niagara as "the ancient *capitol* of Upper Canada."

If not narrowly watched, geographical names, ancient and modern, are liable to some singular metamorphoses in the process of printing. In my old copy of the *Geographia* of Dionysius Periegetes, the editor, "Edw. Wells, A.M., Ædis Christi Alumn," inserts at the close of his preface the general deprecation : "Orandum restat ut quæ in hoc Libro passim occurrant sphalmata (sive currente prelo serius deprehensa, sive aliunde orta) ea lector candidus facile condonarit." In a brochure of less than 130 pages, *sphalmata passim!* in the second edition too, and "è Theatro Sheldoniano." This was in 1709. According to Mr. Burton, who narrates the story in his "Book-hunter,"—in the work of a scrupulously accurate writer, an assertion appears which, could it be substantiated, would be of some interest to ourselves : it is to the effect that, on a particular occasion Theodore Beza went to sea in a *Canadian* vessel. This statement, if true, would tend to show that at the close of the 16th century the shipbuilding interest of Canada was already a thing *in esse*. Unfortunately, however, for the reputation of the early enterprise of our country, it was afterwards explained that an officious corrector had, without any authority, been interpolating an *a*. It was in a *Candian* vessel that the embarkation of Beza had taken place.—By a blunder of the press another name with which we have some concern, occasionally comes quite unexpectedly into view. In my copy of Carl Ritter's Comparative Geography (p. 102), I am startled when I read that "the Caucasus may be regarded as the circumvallation of the American plateau." Of course *Armenian* is intended to be said.

On the other hand, in *Locrine*, a play attributed to Shakspeare, in the lines

> "A gift more rich than are the wealthy mines
> Found in the bowels of America"—

supposed to be uttered before the Christian Era, an effort has been made to do away with the anachronism by imagining a misprint for

Armenia or Armorica. But in this instance, brought out as was *Locrine* in the reign of Elizabeth, when the wealth of America lately found, was the common talk, it is likely that the disputed word is right. In regard to a sentence in Salverte's "History of the Names of Men, Nations and Places," (vol. ii. p. 158), which sets forth that "two Welsh colonies that have been settled in America for the last five centuries, still call the island from which their forefathers sailed, Brydon"—one is at first inclined to think that *America* is here *Armorica,* having in memory the passage to be seen in some copies of Nennius about the "Britones Armorici qui ultra mare sunt," *i. e.* in Western Gaul or Brittany (p. 21). But on second thoughts, it seems probable that Salverte is referring to the emigrants under the somewhat mythic Madoc of whom Southey sings.

As a specimen of an early misprint continuing through many editions, I adduce a passage from the works of Bishop Jeremy Taylor. In all the common editions of his treatise, entitled "The Rule and Exercises of Holy Dying," in the third section of the second chapter (vol. i. p. 528), the words "relieving poor Lazarus" occur, yielding, as read in connection with the context, a fair sense. But in the edition of 1652, the expression is "relieving poor Lazars," *i.e.* poor destitute persons. It need scarcely be mentioned that "lazar" is a generalization from "Lazarus," the typical poor man in the Parable. No doubt the word written down by Jeremy Taylor was "Lazars"; but this term having become, in the lapse of a few years, to some extent unfamiliar, is changed in its passage through the printing office into "Lazarus." The apparent meaning of the passage not being thereby materially affected, the altered word has continued to be perpetuated in the modern editions. In the "Dirige" of a "Primer" of Henry VIII. of the date 1535, "Lazarus" is written "Lazer." "Thou hast raised up again Lazer from the grave when he savoured."

On the other hand we must be careful not to permit the re-introduction of readings that are faulty, simply because the *editio princeps* can be quoted as authority. The editor of Tegg's "Spectator," date 1860, cites the original Folio as ground for the lection "wild fields of ether" in Paper 420. The paragraph runs thus: "If we contemplate those wild fields of ether that reach in height as far as from Saturn to the fixed stars, and run abroad almose to an infinitude, our imagination finds its capacity filled with so immense a prospect," &c.

Instead of "wild fields of ether," the standard editions of the "Spectator" give here "wide fields of ether," an expression that certainly commends itself as far more probable than the other.

As an example of the immobility of matter when once got into type in a particular way, I add from my old copy of Milton's "Paradise Lost," of the date of 1678, four years after the poet's death, two lines in the tenth Book, printed thus:

> "Childless thou art, childless remaine,
> So death shall be deceiv'd his glut and with us two," &c.

Here "So death" belongs to and completes the metre of the preceding line. The fault began in the first, and was repeated in the second edition, during the lifetime of Milton, and is here continued in a third put forth four years after the poet's decease.

Sometimes a whole impression will exhibit a mis-reading from the too implicit adherence of the compositor to his copy. The edition of Littleton's Latin Dictionary of the year 1678, is said to contain among the meanings of *concurro*, the rather singular one of *condog*. Having ventured the question "did not 'concur' come in among the English meanings of concurro?" the amanuensis received from the lips of the lexicographer the somewhat Johnson-like response "concur?—condog!" The note facetiously taken thereof, in due time found its way into the Dictionary *sub voce*.

In the printed copies of the Public Liturgy of the English Church one or two errors of the press have been so often and for so long a time repeated that they may be almost considered as belonging to the class of established mistakes. By a typographical oversight some years ago, in what is known as the General Thanksgiving, the word "may" was left out. In editions of 1733 and 1762, which I happen to have at hand on my shelves, the language is all right—"that we may shew forth Thy praise." But in tens of thousands of copies issued in England during a century past, the omission of "may" is perpetuated. In the Liturgy as used in Scotland and in the United States, the word has never been missing.

The change in the Marriage Service of "depart," as it stands in my copy of 1616, into "do part," as we now see it in modern editions, looks at first sight, very like a misprint. But the alteration was made, it appears, intentionally, just before the so-called Act of Uniformity. It was a condescension to popular misconceptions; very likely an adoption of a common rendering of the phrase in audible speech. The arbitrary conversion of a particle in composition into a separate auxiliary and then making the residue of the word another separate verb, all for the purpose of producing an expression that should have, in the vulgar ear, a sense, amounts almost to a quibble or pun. "Depart," in its direct sense of "separate," was no more obsolete at the time in the English language than was "troth" for "true-word," or "endow" for (so to speak) "endower." But linguistics not being an established science in the early years of the reign of Charles II., the divines of that day are to be excused for not being alive to all the niceties of their mother tongue.

This will be as fitting a place as any to notice another obsolete expression which, nevertheless, under a changed form, continues in vogue, established in the language by being printed now in its metamorphosed state. Modern writers of verse who affect the antique, think they give an archaic air to their productions by occasionally inserting the words "I wis." For the eking out of a line when two syllables more are essential, the formula is very convenient. In modern reprints of early English poetry this "I wis" is to be seen given as here, as though it were a verb "wis," preceded by a pronoun of the first person. But in the original editions of the early English poets, the expression appears in a different guise. In them it is "iwis," or "ywis," one word, an expletive with the sense of "assuredly," "in truth." Thus it is interpreted in the notes and glossaries. Here is an example from Chaucer's "House of Fame":

"Certes, quod I, in all mine age
Ne saw I such a house at this,
And as I wonder'd me ywis
Upon this house," &c.

And again, in the "Friar's Tale," v. 33.:

"Of his office I shall him tell ywis."

It is likely that in Shakspeare's time this expression, though still in common use, was popularly misunderstood; and had begun to be written down and misprinted in the way already indicated. It is certain that in the four passages of Shakspeare where "I wis" occurs, it does no injury to the sense to interpret it as we should do in Chaucer, as a synonym for "surely;" and such it is probable Shakspeare intended it to be. In the Glossary to the Globe edition of his works, the notice of the expression stands thus, without further explanation: "Wis, in the compound 'I wis,' certainly. R. III. 1. 3." It is, no doubt, one more form of the Anglo-Saxon *ise, gese, gise*, and *gyse*, which are all our modern *yes*, and akin to *gewiss*, the Netherlandish and German for "in truth."

In the old English "iwis," it is obvious, I think, that we have the original of the New Englander's "I guess." It is well known that the first English colonists brought with them to this continent many expressions which were in vogue in the mother country at the time of their departure from it, but which while maintained through them in some use here, have now became well-nigh obsolete there. The idiomatic use of "I guess" and "guess" without the "I," in the Biglow Papers of Professor Lowell, is quite Chaucerian when read as "I wis,"—as, for example, where Sawin says of the negro who, by suddenly running off with his wooden leg, had him at such a great disadvantage: "He showed his ivory some iwis." In fact, it is acknowledged that "guess" is akin to the Anglo-Saxon verb *wissian*, and, as may be seen by the comparison of *guard* with *ward, guerre* with *war*, &c., *gu* and *w* are often interchanged. An expression usually held to be simply a vulgarism thus suddenly ascends into the sphere of poetry.

One other phrase may be added which modern typographical use has fixed in the language in a changed form. We all probably know the first line of a certain hymn, "With one consent let all the earth." Now, in the time of Shakspeare, it is certain that the form of speech "with one consent" used in relation to music and song, was understood to be written "with one concent." In the early editions of Shakspeare, the lines 181 and 206 of Henry V. i. 2, exhibited in both instances, "with one concent." And thus the words are printed in the Variorum edition of Reed. Steevens' note on the place is this: "I learn from Dr. Burney that *concent* is connected with harmony," and that "*concentio* and *concentus* are both used by Cicero for the union of voices or instruments, in what we should now call a chorus or concert." Of course, the word is *con-cantus*, a joint singing. There is an especial appropriateness then in, at all events mentally, understanding the words "With one consent let all the earth" in the sense anciently intended by the words, however immaterial now may be the error in their received typography. It is not impossible that the well-known word "concert," a musical entertainment, is also an established misprint. No satisfactory account of the term is given by the etymologists. May it not be an uncorrected *erratum*, if not for *consert*, at least for *concent?* Either word, considered in respect to derivation, would give the idea desired to be conveyed. One note more and we have done with cases of this sort: "Manifold" is also a word fixed now in the language in an altered state by means, mainly, of a wrong typography. In the old English it is, according to its obvious etymology, "many-folde." Thus in Nicholas Udall's translation of the Preface of Erasmus to St. John's Gospel (temp. Ed. vi.), we read of the prince "that poulleth the people, that oppresseth the poore, that by wars defaceth alle both good and bade, he that is the occasion of *manyfolde* calamities," &c. And in Shakspeare's *Lover's Lament:*

> "The heaven-hued sapphire and the opal blend
> With objects manyfold."

It might as well have remained in this form, luminous to the eye like "many-sided." But "manifest" (connected with *manus*) had an influence; or the *i* in *multiplex*.

In a book so carefully printed as is the English version of the Bible generally, it is not to be expected that errors of typography remain undiscovered. Rewards, I believe, are offered by the Privileged printers for the detection of literal faults in the costly folio editions. In the time of the Commonwealth, impressions of the Scriptures came forth that abounded with typographical errors. In one of them, it is said, so many as six thousand mistakes have been enumerated. In 1632, the Royal printers were fined in the sum of £3000, for overlooking the omission of "not," in one of the commandments. Archbishop Ussher, on one occasion, having to purchase a Bible in a hurry, in his way to preach, at Paul's Cross, found, to his astonishment and dismay, that the text, on which he was about to hold forth, was not therein contained. Certain copies of the Bible, which happen to have, in one place, the misprint of *vinegar* for *vineyard*, fetch an extra price among book-hunters. It does not appear why an error which, typographically, is so natural, should be considered especially curious. An Edinburgh edition of the Scriptures, of the date 1637, gives a more unfortunate perversion to a passage, by reading "religious" where it ought to "rebellious."—One or two minute matters, involving verbal error, connected with the typography of the English

Bible, may be stated.—The familiar word, "helpmate," sometimes used as a synonym for "wife," had its beginning in a defective printing of the Scripture terms "help meete." It would appear that, by accident, first the space dropped out from between these two vocables, and then the double *e* of "meete," as, in the old English, it would be written, was taken to be an *a*. Again: there is a certain passage in the History of the Jewish Kings (vide 1 Sam., xxvii., 10.), which to us, in these days, sounds as if it contained a misprint, of "road" for "raid." King David, a fugitive from his native land, has made a rush over the border, with an armed band; and, after slaughtering men and women, has carried back with him "the sheep and the oxen, and the asses and the camels, and the apparel." Achish, his protector, in the place of his exile, on seeing the spoil, asks, "Whither have ye made a road to-day?" But here is no misprint. "Road" and "raid" are the same words; the former the Southern, the latter the Northern, form. Both are modifications of the Anglo-Saxon *rad*, which denotes not only the act of riding, but also the provisions made for its exercise; namely, a cleared highway. We have the word in Shakespeare, in lines 36—39, act 1., sc. 2., K. Henry V.:—

> "We must not only arm to invade the French,
> But lay down our proportions to defend
> Against the Scot, who will make road upon us."

In the Geneva version, in my old copy of 1603, the inquiry of Achish is, "Where haue ye bene a rouing, this day?" The word "raid," now so familiar to our Canadian ears, is not to be found in lexicons printed a few years since. It is not in my copy of Worcester, of the date 1847, nor is it in the body of Ogilvie's Imperial, of the date 1850. In the Appendix to the last-named Work, it is given as a Scottish provincialism.—Another word become, of late years, known to us, in a modern sense of its own, is "Philistine." It is not improbable that this, in its present English shape, is the offspring of a misprint. In my Geneva version, of the date 1605, to which I have, already, more than once referred, "Philistine" is everywhere printed "Philistim;" or, rather, in the plural, somewhat pleonastically, Philistims; just as we now, in our English way, say "Cherubims," when "Cherubim" is, already, plural. It is to be suspected that, on some occasion, the last member of the final *m* has been taken for an *e*, and then printed accordingly. "Philistine" was next assumed to be the possessive of the poetic *Philistia*, the very un-Hebrew appellative made to represent "land of the Philistim;" sometimes rather boldly Latinized into *Palæstina*, also.

There is one place in the English Bible where, in very many of the modern editions, a misprint will be observed, about which there can be no question. It is in a part of the History of the Jewish Judges (ix., 53.), where an old Saxon expression occurs, which, from its having now become unfamiliar, is liable to be wrongly understood by printers. I find the passage incorrectly given in my copy of Bagster's carefully executed Polyglot, of the date 1831; and in other editions of the Bible which I have at hand. In Bagster's Quarto, generally known as the "Comprehensive," and in such of the authorized issues as are, at this moment, within my reach, the printing of the sentence is accurate.—Abimelech, a usurper, while beseiging a walled city, is struck on the head by a heavy stone, thrown down, as it happened, by a woman. The incident is thus narrated: "A certain woman cast a piece of mill-stone upon Abimelech's head, and all to-brake his scull." The misprint, when it occurs, is found in and about the expression "to-brake." The compositor, not versed in the ancient Saxon phraseology, is inclined first to expunge the hyphen and to set up the remaining vocable, as though it were "break." The passage is then made to read as though it were simply a statement of the intention of the woman, in casting down the stone, not of the effect of the blow. But the old English verb "to-break" (its parts thus connected together by a hyphen), is an intensive of "break," just as in the Anglo-Saxon *to-bræcan* is of *bræcan*. The *all* which precedes renders the word more emphatic still. So that "all to-brake his scull" is an exceedingly strong statement of the injury, not simply intended, but inflicted. This use of the Anglo-Saxon prefix *to* is to be met with in Chaucer. Thus, in the Knight's Tale, L., 1699, we read:—

> "With mighty maces the bonés they to-brest;"

that is, completely burst or crushed. In Shakspeare, also, in the Merry Wives (iv., 4. ll., 56, 57.), one of the directions about to be given to certain supposed urchins, ouphes, &c., in regard to Falstaff, is this:—

> "Then let them all encircle him about,
> And, fairy-like, to-pinch the unclean knight."

Here the usual varieties of printing will be found. Warburton, evidently not being aware of the idiom, suggested "fairy-like, too;"

and Theobald edits, without remark, simply "to pinch."—Milton, in one place (Comus, 375—380), has imitated this old expression :—

> ——— Wisdom's self
> Oft seeks to sweet retired solitude;
> Where, with her best nurse, Contemplation,
> She preens her feathers and lets grow her wings,
> That, in the various bustle of resort,
> Were all to-ruffled and sometimes impair'd."

Two misrenderings, at this place, are exhibited by the editions; some giving "too," and others "all-to."—We have retained the intensive *to* in *together*, the Anglo-Saxon *to-gædere*, which we make additionally strong by placing "all" before it, in our "altogether." Our *too* is this same particle *to*, strongly accented.—In my old black-letter Bible, of 1615, the language at the place in "Judges," above referred to, is not so antiquated as that of the more recent version. It is quaint, of course, but quite clear in its meaning: "A certaine woman cast a piece of milstone upon Abimelech's head, and broke his braine-pan." (With "braine-pan" for "head," compare the Late-Latin and Italian *testa:* in the first instance, an *earthen jar;* and, secondarily, a *head.* Hence the French *tête.*)—I have one more instance, a very clear and curious one, of a typographical error in the English Bible, that commonly circulates in the community. In this case, not only has a word been altered, and the idea conveyed by the passage changed; but, in consequence of the difference, a portion of our phraseology in intercourse, one with another, has been burdened with an inaccuracy. "To strain at a gnat" is an expression derived from a passage in St. Matthew (xxiii., 24.), and has become a part of the language of the people. The phrase is the result of an uncorrected error of the press. It should be "strain out a gnat." More than a hundred years ago, "out" was here, by some accident, misprinted "at," in an edition which appears to have been universally followed. The allusion, in the expression, is to the process of purifying wine from any extraneous substance that may, by any chance, have fallen into it. A very particular grower, to get rid of the smallest insect suspected to be in the "must," will pass and repass whole vats of it most carefully through a straining apparatus. From the precincts of the vineyard, the phrase found its way into the common language of oriental life, to denote an excessive scrupulosity in regard to small matters, especially when conjoined with a want of conscientiousness in regard to great ones. A glance at the Greek original shews, of course, that "out" is the proper word. Its blundered representative, "at," has implanted, in the popular mind, the notion, wholly wrong, and rather unbecoming, that there is, in the saying, an allusion to a difficulty experienced in getting some minute and, at the same time, disagreeable thing down the throat. In my black-letter Quarto, of 1615, already referred to, the passage is free from the erratum in question. And, among the notes in the margin, I observe one on this place which, judging from the way in which misprints are occasioned, may have been the cause of the original error. That note is an interpretation of the metaphor of the proverb: "Ye stay at that which is nothing, and let pass that which is of great importance." May not a compositor, setting up from a copy containing some such annotation as this, have had his eye drawn aside to the "at," which stands close to its beginning? This instance of typographical inaccuracy has been repeatedly pointed out, but never set right. So long ago as 1754, John Wesley, in his excellent "Explanatory Notes," exclaimed "It is strange that glaring misprint 'strain at a gnat,' which quite alters the sense, should run through all the editions of our English Bible!" (Vide p. 94, Quarto ed.) It is a curious phenomenon to observe how quickly verbal errors became established, and how their continuance is vulgarly preferred to their removal, even when their character is pointed out. Here we discern the ground of the sad Machiavellian maxim,—"Vult populus decipi; ergo decipiatur."

In view of the ease with which a short-lived tradition will invest typographical mistakes with a sort of weight and authority, and of the reluctance with which many men submit to be informed of them, the world is to be congratulated that a certain bull of Pope Sixtus V., prefixed to an edition of the Vulgate (1585—1590), had little effect. It forbade all printers, on pain of excommunication, to vary one jot or tittle from the text then and there presented. The edition was speedily found literally to swarm with misprints. Could the prohibition have been enforced for a decade or two, a possibility, nay, as we see, a probability would have been established, of the perpetuation, in after-generations, under sanctions the most solemn, of a number of frivolous errors in language and common thought.

A local example of the influence of a typographical error, kept for a short space of time before the public eye, may be mentioned. It will very likely be remembered that, not many months since, a newly invented lamp was extensively advertised under the name of the *Fumivore.* In one of our Toronto Daily Journals this term was to be seen for a series of weeks, rather conspicuously misprinted *Fumirore.* It was curious to notice how quickly among the less educated the *Fumirore Lamp* began to be talked about and inquired after.

In connexion with misunderstandings arising from errata it may, perhaps, be expected that I should say something on the subject of a wrong punctuation. But it would be endless to notice the passages in authors in which a difference in the sense is produced by a difference in the placing, or omission, of stops. Early manuscripts, like ancient inscriptions, had, as we know, no punctuation as we understand the term. Nothing short of a miracle therefore could be expected to establish among editors a unanimity on this head. It is well known that advantage was taken occasionally of this abuse of points to construct oracular responses which should be capable of a double sense, the meaning varying as you dropped the voice in one place or in another. The stock example of such a sentence is the answer to Pyrrhus when he inquired as to his chances against the Romans: "Aio te Æacida Romanos vincere posse,"—travestied in a recently-manufactured versicle "Aio Philistinos te Bospore vincere posse." And I might quote a passage from the Apology of Justin Martyr (I. 6), where the punctuation has given rise to lengthened debates on a deep question of orthodoxy; and, were I at liberty to explain at length, it would instantly be seen by every one that the discussion was not a trivial one. I pass over this instance because, to enter into particulars in regard to it, would be here out of place; and I present another which will answer my purpose just as well; an exaggerated one perhaps, and embracing details ingeniously invented if not strictly true. It is a sentence supposed to be taken from the correspondence of a country newspaper, wherein the writer describes what he saw as he sat in the gallery of the House of Commons:—"Lord P. then entered on his head a white hat upon his feet large but well-polished boots upon his brow a dark cloud in his hand his faithful walking-stick in his eye a menacing glare saying nothing he sat down." The whole communication is to be imagined as sent without any visible markings-off of its clauses. These having been supplied in the village printing office, in every instance *wrongly*, sad senses were made out of the writer's matter, as will be seen by every one who makes the experiment on the extract presented.

In the Athenæum Library at Boston, is shewn as a curiosity, a volume by an early worthy of New England, named Timothy Dexter. Its title is a "Pickel for the Knowing Ones." So troubled was this writer in regard to the matter of punctuation, that he at length decided to omit the points altogether, giving, however, at the end of his book several pages of all the varieties of stop, with an invitation to the reader "to pepper his dish as he chose." This is the peculiarity on account of which the book is exhibited.

Very much of the literary criticism on Shakspeare has been expended, not on his own genuine words, but on what are in reality typographical misrepresentations of them. The folio of 1623, the first printed collection of the dramatic works of the great poet, is full of errors, either of the press or, antecedently, of the pen. The actors Heminge and Condell were indifferent editors. Seven years after Shakspeare's death they gathered together and gave to the world the plays as they found them in the property-rooms of the theatres—some already badly printed; some still in manuscript, blotted, obscure and worn, taken down in many places from oral tradition and interlarded here and there with portions of the *ad libitum* trifling indulged in by buffo players. Intelligent possessors of a folio appearing in such a condition would naturally, from time to time, check its contents by earlier printed copies of separate plays, and by their own individual knowledge of the text as heard on the contemporary stage. There can be no doubt that very many of the manuscript corrections to be read in Mr. Collier's copy of the date 1632, were made on good authority. It can well be conceived what a field has been here found for the exercise of literary sagacity. After a lapse of two hundred and fifty years the work of emendation may be supposed to be approaching completion. A few more happy guesses, commending themselves to the general understanding and good taste of qualified men,—and, to the already innumerable recensions of Shakspeare, one more will be added, with letterpress everywhere clear of marks of doubtfulness, its subject-matter to be grasped and thoroughly enjoyed, page after page, without interruption from commentator or critic.

A near approximation to such a Shakspeare is to be found in the now widely-known Globe edition, printed in 1864 at the University press of Cambridge, and of which in October last, 50,000 copies had been sold by the Messrs. Macmillan & Co. Into its text many emendations have at last been admitted which, notwithstanding their self-evident correctness, were previously to be seen only in appended foot-notes. Nevertheless, the obelus still appears by the side of a passage here and there where, as yet, in the opinion of the editors, no admissable improvement has been proposed, or where lacunæ occur too great to be filled up with any approach to certainty by conjecture. As a kind of contrast to the very enjoyable Globe edition, we may notice here an elaborate typographical curiosity, having relation also to the name of Shakspeare. This is Mr. Booth's reprint (1864), on paper of three several forms, of the folio of 1623. The announcement of the publisher in respect to this work, will be read with mingled feelings of pain and pleasure:—"This beautiful volume is the most perfect re-production that could be imagined or desired of the first and only authoritative edition of Shakspeare's Works. So great pains have been taken to secure accuracy that every head-piece, ornament and line has been carefully copied, and every broken or deformed letter preserved. Though the book has now been nearly two years before the public, not a single inaccuracy has been discovered." A production thus remarkable for its accurate inaccuracy appropriately finds a place in a catalogue of *errata recepta*. Another cognate, and in a scientific point of view, more interesting publication should also be noticed. Not only has the folio of 1623 been thus, with all its faults, minutely edited and carefully printed; it has also been brought out complete and in perfect fac-simile by the process of photozincography. The literary man may thus have upon his own private shelves a copy of Shakspeare in a manner identical with one of the original folios of Heminge and Condell—a copy actually struck off from the face of one of them by the all but miracle of solar typography.

All students of English are interested in the text of Shakspeare. Its perfect purity is a thing greatly longed after. Every rational contribution to this end meets with a welcome. I venture then upon a remark on three several passages which continue to be obelized as, after various treatment by the commentators, incurable. In regard to each respectively I offer a reading, which, as it has struck me, may be really the original one.

> "Siquid novisti rectius istis
> Candidus imperti; si non, his utere mecum."

In each case I have been more or less led to the suggestion made by the application of a rule deduced long ago from considerations in regard to old fashioned hand-writing similar to those spoken of by Mr. J. P. Collier, in his "Account of Early English Literature," (ii. 259.) He is observing on the couplet from a now forgotten writer—Barnaby Rich:

> "To what impression I have wrought it now,
> The wise may judge, for fools feare not how."

After pointing out that in the second line, both sense and measure detect a misprint, and that "I care not how" ought manifestly to be read instead of "feare not how;" he adds, "When we recollect that in manuscript of the time (1613) the pronoun *I* was constantly carried below the line, it is easy to understand how 'I care' came to be misprinted 'feare.' This mode of detecting errors in old books has never been sufficiently attended to; and editors of Shakspeare have often preserved blunders, because they did not consider, or perhaps did not know, how words would look in writing of the period."

1. In Act iii., sc. 2. of Romeo and Juliet, the beginning of the sixth line (the *locus conclamatus*) should, I think, read:—

> "That Erinnys' eyes may wink."

It is quite in Shakspeare's way to put into the mouths of his characters mythological names well-known through the translations in vogue in his day, of Homer, Virgil, Ovid, &c. In line 2, of this scene, we have 'Phœbus;' in line 3, 'Phåethon.' The fury 'Erinnys,' familiar from Virgil's

> "In flammas et in arma feror, quo tristis Erinnys,
> Quo fremitus vocat, et sublatus ad æthera clåmor—"

is here conceived of as promoting the fierce family feuds which were distracting Verona, and rendering adventures, like that of Romeo, exceedingly dangerous. In Act ii., sc. 2., line 70, Juliet says to Romeo, "If they (any of the Capulets) see thee, they will murder thee."—The name 'Erinnys,' with similar associations, is employed by Shakspeare in line 5 of 1 Hen., iv. 1. 1.

> "The thirsty Erinnys of this soil."

That is to say, it is highly probable (as Mr. Monk Mason suggested) that 'Erinnys' is the right reading here, also; and, accordingly, the word is given in the Concordance of Mrs. Cowden Clarke, with this one reference. But the idea of 'Erinnys' occurred to me as the proper lection in the place referred to in Romeo and Juliet, while considering one of the lines in the Latin invocation which, in the "Tragedy of Locrine," a piece already referred to as, possibly, a juvenile essay of Shakspeare's, Albanact is supposed, somewhat unnaturally, to utter as he dies:—

> "Nox cæci regina poli, furialis Erinnys."
>
> *Act ii., sc.* 7.

The word that causes the trouble in the received text, as possessing in the place no tolerable meaning, is 'runaways.' I account for the appearance of such a singular expression in some such way as this: By the careless blunder or provincial pronunciation of an ill-educated reader or prompter, 'Erinnys,' or, perhaps, as it ought to be, "Erinnys's," was, on some occasion, made to sound as though it had been 'runaways.' As such, or rather, according to the old mode of spelling, as 'runawaies,' it was committed to paper, in jest or in earnest; which paper unfortunately became, at last, part of the 'copy' from which the Folio of 1623 was printed.—The suggestion of the Manuscript corrector of the Folio of 1632 is 'enemyes,' which will give a certain sense, especially if *'s* be attached to the preceding particle 'that:' "That's enemyes' eyes," for "That his enemyes' eyes." But 'Erinnys,' to my thinking, was the word employed here by Shakspeare. Let the passage, read with this correction, speak for itself.

2. The two hundred-and-ninety-ninth line in Scene 1. of the Fifth Act of Hamlet, is one of the 'still-vext' places of Shakspeare. I feel sure that it should be read,

> "Woo't drink up Nilus? eat a crocodile?"

Indistinctness of writing, perhaps the wrong orthography of a *y* for an *i*, and an accidental transposition of syllables in the printing-office, have, together, converted the original word (as I believe) *Nilus*, into *Eysell*, *Eisil*, or *Esil* (in these several ways the modern text is given) conjectured, by the commentators, to be, variously, *esil* (that is, perhaps, *vinegar* in the sense of *poison*), or *vessels* (that is, huge caldrons), or, inasmuch as the word, from its being printed in Italics in the Folio, and beginning with a capital letter, must needs be a proper name, Yssel, Issell, Oesil, Weisel, all names so humored in the writing as to denote rivers which a Prince of Denmark might be supposed to know.—One editor, however (Hanmer), came very near the truth in suggesting *Nile*; but *Nilus* did not strike him. He was, consequently, obliged to eke out the line with an "or" in addition, and so he marred the characteristic abruptness of Hamlet's rapid queries, by causing him to put the alternative: "Wilt drink up Nile, *or* eat a crocodile?"

The mad challenge of Hamlet is to drink up even *Nilus*, a household word for a stream extravagant in its overflowings. The name, *Nilus*, thus given at full length, occurs elsewhere in Shakspeare; as, for example, in Titus Andronicus, iii., lines 70-1:—

> "My grief was at its height, before thou camest;
> And now, like Nilus, it disdaineth bounds."

3. My third correction is in the eighth line of the Hundred-and-Twelfth Sonnet. I read—

> "That steel'd am I 'gainst censure, right or wrong."

The editors confess that this line, as usually printed, yields but little meaning:—

> "That my steel'd sense or changes right or wrong."

Like some other portions of the Sonnets and plays of Shakspeare, this line has, I think, first been taken down wrongly, from dictation, and then inaccurately printed; not only with particular letters, points, and marks of elision mistaken, but with a confusion of order in the words. By printing, as I have suggested, we recover the excellent Shakspearean term "censure," and get rid of the expression "sense;" which is not likely to have been written here, when it occurs so immediately afterwards, at the end of the tenth line of the Sonnet.*

As a final remark, I add that I think there ought to have been admitted, without further hesitation, into the Globe edition, the following corrections: "Seamews," for "seamels" (ells), in l. 176, Act ii. sc. 2, Tempest; "bollen bag-pipe," for "woollen bag-pipe," in l. 56, Act iv., sc. 1, M. of Venice; and, "Ethics" (ickes), for "checks" (eckes), in l. 32, Act i., sc. 1, T. of the Shrew.

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* In regard to the apparent violation of grammar, in the eleventh line, where the nominative to "are" is "sense" in the preceding line, the reader is to observe that "adders' sense," in this place, having the meaning of "ears," is to be taken as a noun of multitude. Thus, "power," as an equivalent to "forces," is used as a plural, in K. John, v. 6. 39—41:—

> "Half my power, this night,
> Passing the flats, are taken by the tide—
> These Lincoln Washes have devoured them."

The above proposed amendment in Sonnet cxii, has been once before suggested by me, in the little publication entitled "Shakspeare—the Seer—the Interpreter." *Vide* Note x., p. 69.

CANADIAN INSTITUTE.

SESSION—1865-66.

Notes on a few new and interesting Canadian Birds, exhibited by George McKay, Esq., Mr. Passmore taxidermist, and from the Museum of the University, by Rev. W. Hincks, 6th January, 1866.

We record very concisely the substance of the remarks made. The pintailed Grouse, Centrocercus phasianellus, though common more to the north, is rarely seen within the bounds of Canada, as commonly understood. We are much indebted to G. McKay, Esq. for the exhibition of a specimen in his possession from the neighborhood of Sault Ste. Marie.

Mr. Passmore exhibited a specimen of Anser Hutchinsii, which seems to be not uncommon, but generally mistaken for the young of the Canada Gorse. Through Mr. Passmore's kindness, Professor Hincks was enabled also to call attention to the peculiarities of a Swan, proposed by him, though with hesitation, as a new species, under the name of Cygnus Passmori. The remarkable difference in weight seemed hardly to be accounted for from age alone. There is, also, a sensible difference in the position of the eye, and in the direction of the line bounding the beak; and the bend of the trachea within the keel of the sternum is very different, so that it was thought difficult to explain it from difference of ages. Yet the question requires examination by the comparison of series of specimens, and can scarcely, as yet, be decided satisfactorily. The comparison of a full grown Trumpeter Swan with the supposed new species, and with a specimen of Cygnus Americanus, could not fail to be interesting to the members present.

FIRST ORDINARY MEETING—*2nd December*, 1865.

PROF. E. J. CHAPMAN, Ph.D., Vice-President, in the Chair.

I. *Papers were read as follows:*

1. By the Rev. Prof. W. Hincks, F.L.S., &c.:
   "On chorisis as a means of explaining certain phenomena of Plants."
2. By the Rev. J. McCaul, LL.D.:
   "On ancient Factions at Rome and Constantinople."
3. Prof. Croft, D.C.L.:
   Exhibited Pharaohs' Serpents and explained their construction and composition.

SECOND ORDINARY MEETING.

9th December, 1865.

PROF. E. J. CHAPMAN, Ph.D., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

Life member, JOHN DICKSON, Esq., Toronto.
Ordinary members, J. C. HAMILTON, M.A., Barrister, Toronto.
" G. M. MACDONNELL, B.A., " "

II. The nomination for office-bearers for the ensuing year took place.

THE ANNUAL GENERAL MEETING.

16th December, 1865.

PROF. E. J. CHAPMAN, Ph.D., Vice-President, in the Chair.

I. Mr. JAMES FRASER was elected a member.

II. The following Gentlemen were declared office-bearers and council without ballot, as only the requisite number had been proposed:

President,	Vice-Chancellor, The Hon. O. Mowat.
1st Vice-President,	Prof. G. T. Kingston, M.A.
2nd "	M. Barrett, Esq., M.A., M.D.
3rd "	J. N. Agnew, Esq., M.D.
Treasurer,	Samuel Spreull, Esq.
Recording Secretary	W. Mortimer Clark, Esq.
Corresponding Secretary,	U. Ogden, Esq., M.D.
Librarian,	Rev. H. Scadding, D.D.
Curator,	W. B. McMurrich, Esq., M.A.
Council,	Professor E. J. Chapman, Ph. D.
"	" Daniel Wilson, LL.D.
"	" J. B. Cherriman, M.A.
"	" H. Croft, D.C.L.
"	" Rev. W. Hincks, F.L.S., &c. ex-officio as Editor of Journal.
"	C. B. Hall, Esq., M.D.
"	A. M. Rosebrugh, Esq., M.D.

III. The Annual Report of the Council was read by the Secretary, and on the motion of Dr. Daniel Wilson, seconded by the Reverend Edmund Baldwin, was adopted.

IV. A Paper was read by Prof. Cherriman, "On Recent Experiments in aerial Navigation."

Dr. Rosebrugh exhibited a series of mecographical photographs and enlarged photographs of micographic objects, executed by Mr. Hollingworth and presented by him to the Institute. He explained the nature of the process and the construction of the camera. At the conclusion he exhibited some enlarged photographs of microscopic objects projected by the magic lantern.

THIRD ORDINARY MEETING.

6th January, 1866.

J. N. Agnew, Esq., M.D., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

Rev. J. A. Williams, Toronto.
George Whitney, Esq., Toronto.
George Murray, Esq., Barrister, Toronto.
William Tempest, Esq., M.D., Toronto.

II. *The following Papers were read:*

1. By Prof. E. J. Chapman, Ph. D.:
   "Remarks on some Minerals from Lake Superior."
2. By Rev. Prof. W. Hincks, F.L.S., &c.:
   "Remarks on some Canadian Birds, with exhibition of specimens."

FOURTH ORDINARY MEETING.

13th January, 1866.

Prof. G. T. Kingston, M A., Vice-President, in the Chair.

I. Johnson Pillit, Esq., of the Village of Grimsby, C. W., was elected a Member.

Prof. Wilson read a Paper entitled: "Notes of a visit to Mal Bay on the St. Lawrence, and exhibited some illustrative sketches and made some observations geological and historical thereon."

FIFTH ORDINARY MEETING.

27th January, 1866.

I. A Paper was read by Dr. U. Ogden—"On the Propogation and prevention of Cholera."

SIXTH ORDINARY MEETING.

3rd February, 1866.

Prof. G. T. Kingston, M.A., Vice-President, in the Chair.

I. Dr. J. O'Dea and Dr. W. H. Cummings were elected members.

II. *The following Donations for the Library received since last meeting were announced by the Secretary:*

Journal of the House of Assembly of Nova Scotia, 1865. 1 Vol.
Statutes of Canada, 1865. 2nd Session, 29 Vic., 1865. 1 Vol.

III. A paper was read by Dr. Rosebrugh—"On some of the optical defects of the eye, and their Treatment with the Scientific use of Spectacles."

Two medals of Churches were exhibited by Mr. G. H. Wilson, viz.: one of the Church of St. Paul, Rome, and St Peter and St. Paul, Philadelphia.

SEVENTH ORDINARY MEETING.

10th February, 1866.

Dr. Agnew, Vice-President, in the Chair.

I. A Paper was read by the Rev. Prof. Hincks, entitled: "Some thoughts on classification in relation to organized beings."

EIGHTH ORDINARY MEETING.

17th February, 1866.

Prof. G. T. Kingston, M.A., Vice-President, in the Chair.

I. A Paper was read by Rev. Dr. Scadding, on "Reed misprints, or Traditional errors in Typography."

NINTH ORDINARY MEETING.

24th February, 1866.

M. Barrett, Esq., M.D., Vice-President, in the Chair.

I. A Paper was read by Dr. Daniel Wilson, entitled: "An Alphabetical History.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO CANADA WEST,—OCTOBER, 1865.

Latitude—43 deg. 39.4 min. North: Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M	10 P.M.	Mean.	6 A.M	2 P.M	10 P.M	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 A.M.	2 P.M.	10 P.M.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.482	29.356	—	—	50.8	54.7	—	—	—	.324	.337	—	—	87	78	—	—	W b S	W b N	Calm.	N 80 W	3.0	6.5	0.0	6.97	7.60	0.085	...
2	.459	.487	29.555	29.5070	37.8	52.6	38.1	44.03	— 5.90	.208	.240	.195	.219	91	60	85	77	W N W	NW b N	Calm.	N 37 W	3.5	8.6	0.0	5.20	5.55	inap.	...
3	.555	.504	.533	.5305	42.8	50.4	41.4	45.42	— 4.12	.232	.218	.195	.218	84	59	75	72	NW b N	N N W	N N W	N 21 W	3.0	12 0	6.8	7.22	7.45	inap.	...
4	.559	.502	.593	.5557	37.0	47.2	45.0	43.97	— 5.07	.193	.239	.230	.235	87	74	77	81	N N W	N W	NW b N	N 35 W	3.2	24.5	13.0	12.27	12.38	...	...
5	.662	.700	.808	.7313	43.5	51.5	42.1	46.05	— 2.57	.223	.224	.223	.216	78	58	83	70	NW b N	N N W	N W	N 33 W	8.2	13.2	6.0	8.21	8.40	...	...
6	.864	.839	.783	.8293	38.5	57.3	48.2	49.08	+ 0.87	.199	.313	.277	.268	85	66	82	76	N W	S b W	SW b W	S 44 W	4.2	6.0	3.0	3.28	4.14	...	...
7	.681	.602	.576	.6145	56.9	65.2	60.1	60.60	+12.75	.408	.536	.489	.466	88	86	94	88	S W b W	W b S	SW b W	S 70 W	6.2	5.0	1.0	4.08	5.65	1.275	...
8	.604	.636	—	—	50.8	53.3	—	—	—	.335	.355	—	—	90	87	—	—	N E	E b N	Calm.	N 57 E	6.2	1.2	0.0	1.66	1.73	0.045	...
9	.614	.503	.494	.5373	43.9	66.3	60.9	58.72	+11.65	.263	.482	.491	.446	92	74	92	88	Calm.	S W b S	S W	S 71 W	0.0	12.5	7.0	6.18	8.24	...	...
10	.603	.602	.671	.6267	60.9	66.3	60.9	62.43	+15.77	.503	.444	.441	.439	94	68	82	77	W b N	E	N b E	N 34 E	3.2	8.0	3.4	3.61	5.82	...	...
11	.724	.602	.438	.5872	47.5	57.6	58.7	53.95	+ 7.70	.264	.320	.455	.320	80	67	92	75	N N E	S E b E	W b S	N 1 E	7.0	6.8	7.2	3.86	7.55	0.045	..
12	.707	.748	.816	.7625	42.5	47.5	40.3	43.43	— 2.53	.218	.170	.185	.189	80	50	73	67	N	NW b N	N N W	N 8 W	6.0	10.2	4.2	6.97	7.08	...	...
13	.817	.720	.640	.7238	34.5	47.2	39.2	40.65	— 4.92	.174	.210	.216	.194	87	64	90	77	N b E	E S E	S E	N 78 E	8 0	3.5	3.4	3.22	4.10	...	...
14	.443	.313	.275	.3387	36.3	52.6	45.0	45.60	+ 0.33	.185	.289	.249	.247	86	73	83	80	N E b N	E S E	N b E	N 20 E	5.6	2.0	0.6	3.71	4.57	...	...
15	.275	.337	—	—	44.6	48.2	—	—	—	.191	.190	—	—	65	55	—	—	N	N b W	N N W	N 18 W	11.0	18.2	9.2	12.17	12.47	inap.	.
16	.641	.651	.738	.6855	31.6	48.6	36.7	39.63	— 4.90	.148	.211	.197	.178	83	61	90	74	N W b N	W b N	N W	N 45 W	1.5	14.6	2 0	7.03	7.16	...	...
17	.731	.657	.565	.6448	29.5	50.8	49.7	44.80	+ 0.57	.129	.233	.247	.208	79	63	69	69	Calm.	S E	E S E	S 41 E	0.0	4.5	9.2	4.88	6.08	0.025	...
18	.409	.335	.258	.3238	51.8	55.5	53.6	53.82	+ 9.78	.300	.331	.395	.363	78	86	96	87	E S E	S S E	S E b E	S 63 E	8.2	4.5	3.5	5.20	6.46	0.460	...
19	.006	28 787	28 843	28.8695	53.6	53.6	47.9	51.57	+ 7.78	.395	.298	.240	.306	96	72	71	79	N E	W N W	W	N 69 W	8.0	22.4	16.4	16.36	17.55	0.160	...
20	.026	29.120	29.298	29.1673	41.4	47.2	38.1	42.17	— 1.40	.205	.139	.187	.181	78	42	81	68	W N W	W N W	W b S	N 73 W	18.5	33.4	5.8	16.12	16.56	0.160	...
21	.445	.573	.759	.6085	35.3	46.4	34.2	38.73	— 4.52	.164	.167	.168	.164	80	52	85	71	W	W b N	Calm.	N 72 W	11.2	23.2	0.0	10.18	10.26	...	...
22	.820	.691	—	—	34.2	51.5	—	—	—	.177	.314	—	—	89	82	—	—	Calm.	W b S	W b N	S 88 W	0.0	11.4	12.2	4.65	5.10	0.105	...
23	.762	.855	.955	.8675	37.0	44.3	33.4	38.67	— 4.08	.201	.139	.134	.165	91	47	70	70	Calm.	NW b N	Calm.	N 6 W	0.0	3.4	0.0	4.18	4.27	...	...
24	.934	.988	.958	.9753	30.2	41.4	34.9	36.40	— 6.10	.112	.126	.159	.138	67	48	78	64	N b E	NW b N	N b W	N 4 E	6.2	1.0	6.4	2.91	3.10	...	...
25	.921	.855	.831	.8648	32.7	43.9	41.7	39.70	— 2.58	.157	.218	.191	.180	85	75	71	73	N N E	N E	N E	N 45 E	4.5	4.2	3.2	4.89	5.07	...	...
26	.824	.836	.920	.8663	42.1	35.6	28.4	34.35	— 7.63	.232	.193	.142	.183	86	93	90	91	N E b N	N N E	N E	N 46 E	11.5	8.4	11.8	10.71	10.74	0.125	2.
27	.839	.736	.542	.6905	25.2	28.7	29.1	27.87	—13.92	.122	.130	.148	.135	90	82	92	88	N E	N E b E	N E b E	N 48 E	13.5	8.8	9.0	9.41	9.49	0.102	1.0
28	.275	.286	.502	.3577	33.4	34.2	32.0	33.03	— 8.45	.171	.177	.173	.171	89	89	96	90	N	N	NW b N	N 35 W	6.6	2.2	16.2	5.31	5.63	inap.	1.5
29	.696	.740	—	—	22.3	38.5	—	—	—	.101	.173	—	—	85	74	—	—	NW b W	W b S	W b S	S 77 W	0 8	11.0	4.3	3 84	3.87	...	...
30	30.015	.982	.900	.9610	34.9	44.3	44.3	41.27	+ 0.32	.161	.205	.230	.201	79	69	79	77	W	S E	S E	S 36 E	0.5	6.4	6.2	4.57	5.84	0.100	...
31	29.848	.793	.929	.8582	43.5	47.2	35.3	42.18	+ 1.43	.259	.229	.163	.209	92	71	79	77	S	W S W	W N W	S 73 W	5.2	6.6	0.2	3.82	5.20	0.018	...
M	29.6313	29.5991	29.6227	29.6187	40.17	49.36	43.05	44.54	— 0.50	.224	.251	.247	.240	85	67	83	77	....	....	....	....	5.63	9.81	5.52	......	7.26	2.705	4.5

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR OCTOBER, 1865.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 30.045 at 8 a.m. on 30th. } Monthly range=
Lowest Barometer . . . . 28.779 at 2.30 p.m. on 19th. } 1.266 inches.

Self-registering Ther.
Maximum temperature . . . 71°.4 on 10th. } Monthly range=
Minimum temperature . . . 21°.6 on 29th. } 49°8
Mean maximum temperature . . 52°29 } Mean daily range=14°22
Mean minimum temperature . . 38°07 }
Greatest daily range . . . . . . 24°8 from a.m. to p.m. of 17th.
Least daily range . . . . 3°0 from a.m. to p.m. of 19th.

Warmest day . . . . 10th...Mean Temperature . . . 62°43 } Difference=34°.56
Coldest day . . . . . 27th...Mean Temperature . . . 27°87 }

Maximum { Solar . . . . 115°4 on 10th } Monthly range=
Radiation { Terrestrial . . . . 13°5 on 29th } 101°.9

Aurora observed on 9 nights, viz.:—on 5th, 9th, 10th, 11th, 15th, 19th, 20th, 23d and 31st,
Possible to see Aurora on 19 nights; impossible on 12 nights.
Snowing on 3 days; depth 4.5 inches; duration of fall 27.5 hours.
Raining on 17 days; depth 2.705 inches; duration of fall, 63.8 hours.
Mean of cloudiness=0.58; Most cloudy hour observed, 2 p.m; mean=0.70; least cloudy hour observed, 10 p.m.; mean=0.46.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2772.32	635.10	997.78	2553.64

Resultant direction, N. 36° W.; Resultant Velocity, 3.55 miles per hour.
Mean velocity 7.26 miles per hour.
Maximum velocity 33.4 miles, from 1.30 to 2.30 p.m. on 20th.
Most windy day 19th—Mean velocity 17.55 miles per hour. } Difference 15.82.
Least windy day 8th—Mean velocity 1.73 miles per hour. }

Most windy hour, 1 p.m.—Mean velocity, 10.27 miles per hour. } Difference
Least windy hour, 10 p.m.—Mean velocity, 5.35 miles per hour. } 4.92 miles.

2nd. Thin ice a. m. Corona round moon at midnight.
7th. Severe thunder storm at night. 8th, Fog at night.
17th. Solar halo 1 p. m.
26th. First snow of season.

October was cool, wet and windy. The amount of snow, although far less than in 1844, is the second greatest recorded.

COMPARATIVE TABLE FOR OCTOBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	44°.4	— 1.2	68°.5	23°.9	44°.6	13	1.860	3	...	...	...	...
1841	41.6	— 4.0	58.3	20.3	38.0	6	1.360	2	...	...	...	0.41 lbs
1842	45.1	— 0.5	68.5	30.0	38.5	8	5.175	0	...	...	...	0.35 "
1843	41.8	— 3.8	65.7	24.5	41.2	12	3.790	4	2.5	...	...	0.54 "
1844	43.3	— 2.3	69.6	17.8	51.8	7	imper	4	12.0	...	...	0.43 "
1845	46.4	+ 0.8	62.7	20.0	42.7	11	1.760	1	inp.	...	...	0.26 "
1846	44.6	— 1.0	69.7	20.7	49.0	14	4.180	2	inp.	...	...	0.44 "
1847	44.0	— 1.6	65.0	20.3	44.7	13	4.390	2	inp.	...	...	0.19 "
1848	46.3	+ 0.7	62.2	26.4	35.8	11	1.550	0	...	N 54 W	1.24	4.60 ms
1849	45.3	— 0.3	59.2	25.5	33.7	13	5.965	1	inp.	N 12 W	1.27	7.76 "
1850	45.4	— 0.2	66.6	24.8	41.8	10	2.085	0	...	N 66 W	1.10	5.30 "
1851	47.4	+ 1.8	66.1	25.0	41.1	10	1.680	2	0.3	S 72 W	1.06	4.39 "
1852	48.0	+ 2.4	70.7	29.8	40.9	12	5.280	0	...	N 5 E	1.19	4.47 "
1853	44.4	— 1.2	64.7	25.5	39.2	10	0.875	2	inp.	S 88 W	1.74	4.77 "
1854	49.5	+ 3.9	74.2	29.8	44.4	15	1.495	3	inp.	N 45 W	1.52	4.57 "
1855	45.4	— 0.2	64.3	28.0	36.3	14	2.485	5	0.8	N 82 W	4.91	9.88 "
1856	45.3	— 0.3	70.1	23.3	46.8	10	0.875	2	0.1	N 76 W	2.15	6.07 "
1857	45.4	— 0.2	63.5	27.7	35.8	10	1.040	2	0.2	N 19 W	2.93	6.24 "
1858	48.8	+ 3.2	76.3	34.2	42.1	17	1.797	1	inp.	N 34 W	0.36	5.96 "
1859	43.0	— 2.6	68.4	22.3	46.1	11	0.940	4	inp.	N 68 W	5.04	8.12 "
1860	47.3	+ 1.7	63.7	28.4	35.3	15	1.618	1	inp.	N 9 W	2.00	6.93 "
1861	48.7	+ 3.1	64.5	30.2	34.3	15	1.993	1	inp.	N 61 W	1.06	5.96 "
1862	48.7	+ 3.1	76.0	27.0	49.0	19	2.684	2	0.5	N 78 W	2.89	6.53 "
1863	45.9	+ 0.3	63.4	30.9	32.5	16	2.522	0	...	S 71 W	0.48	6.16 "
1864	45.2	— 0.4	64.8	28.4	36.4	22	3.321	1	inp.	N 60 W	3.17	6.66 "
1865	44.5	— 1.1	66.6	22.3	44.3	17	2.705	3	4.5	N 36 W	3.55	7.26 "
Results to 1864.	45.65	...	66.67	25.79	40.88	12.6	2.530	1.8	0.78	N 60 W	1.74	6.14
Exc. for 1865.	—1.15	...	—0.07	—3.49	+3.42	+ 4.4	+ 0.175	+ 1.2	+ 3.72	...	...	+1.12

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—NOVEMBER, 1865.

Latitude—43 *deg.* 39.4 *min. North.* *Longitude*—5 *h.* 17 *min.* 33 *sec. West.* *Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M.	10 PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 PM	Result.	ME'N		
1	29.942	29.866	29.610	29.7822	38.5°	46.4°	47.0°	44.18°	+ 3.72°	.190	.240	.237	.226	81	76	73	77	Calm.	E	E S E	S 56° E	0.0	7.5	11.6	5.36	6.12	0.050	...
2	.488	.566	.715	.6060	48.2	49.0	39.6	44.97	+ 4.70	.317	.205	.202	.236	94	59	83	78	S W	W	W S W	S 71 W	6.5	17.0	5 5	7.33	7.57	...	...
3	.750	.667	.592	.6667	32.4	46.4	38.8	39.88	— 0.12	.169	.221	.186	.194	91	70	79	79	W	S b W	Calm.	S 14 W	3.0	6.2	0.0	3.21	4.21	...	...
4	.458	.331	.228	.3378	42.1	46.1	37.8	40.97	+ 1.20	.249	.206	.199	.220	93	66	87	86	S	S S W	N W	N 65 W	0.5	1.0	19.8	6.18	7.71	0.335	...
5	.339	.530	—	—	33.4	33.3	—	—	—	.149	.158	—	—	78	83	—	—	N W	N W	W	N 66 W	19.5	23.5	5.5	13.52	15.85	...	0.2
6	.494	.233	.564	.4345	34.5	39.6	36.0	37.05	— 2.12	.174	.150	.162	.159	86	61	76	72	S W	SW b W	W b N	S 87 W	21.7	18.2	32.0	15.48	18.62	0.070	0.2
7	.882	30.080	30.088	30.0313	25.2	28.7	26.6	27.50	—11.50	.115	.109	.126	.120	85	69	87	80	N W b W	N b W	Calm.	N 16 W	6.6	4.6	0.0	2.72	5.14	...	...
8	30.012	29.790	29.638	29.7997	33.4	39.6	41.7	38.73	+ 0.05	.171	.176	.200	.179	89	72	76	76	S E	E S E	Calm.	S 24 E	6.2	6.6	0.0	3.83	6.12	...	...
9	29.759	.922	30.090	.9448	38 1	41.9	32.0	36.55	— 1.85	.187	.184	.143	.165	81	71	79	75	W b S	NW b N	N	N 43 W	1.2	18.0	9.0	8.50	10.27	...	...
10	30.229	30.268	30.334	30.2872	28.4	30.6	27.7	28.72	— 9.37	.126	.114	.121	.121	81	67	80	77	N	N b E	N E b N	N 26 E	9.0	6.0	3.0	5 02	5.15	...	...
11	30.293	30.239	30.146	30.2217	27.7	31.6	29.1	29.10	— 8.68	.128	.126	.133	.126	84	70	82	78	N E	NE b E	Calm.	N 54 E	5.5	4.0	0.0	2.24	2.25	...	...
12	30.066	29.923	—	—	26.2	47.2	—	—	—	.124	.258	—	—	87	79	—	—	Calm.	S W b W	SW b W	S 57 W	0.0	8.2	2.7	6.04	6.33	...	...
13	29.710	.579	29.558	29.6142	36.3	55.8	44.6	45.70	+ 8.52	.176	.258	.217	.213	82	58	74	71	SW b W	W b S	W b S	S 62 W	6.0	14.2	9.4	8.18	8.52	...	...
14	.536	.483	.456	.4988	44.3	54.7	45.3	47.68	+10.78	.225	.273	.245	.241	77	64	81	73	W S W	S W b S	S W	S 42 W	7.0	10.6	2.2	5.50	5.56	...	...
15	.506	.485	.619	.5453	43.2	55.5	43.5	46.68	+10.18	244	.326	.240	.257	87	73	85	80	SW b W	W S W	SW b W	S 53 W	4.4	7.5	3.5	4.61	4.73	...	...
16	.593	.539	.429	.5125	41.4	53.6	47.2	46.85	+10.65	.232	.288	.268	.261	89	70	82	81	SW b W	S b E	S E b S	S 6 W	2.0	5.8	0.6	3.39	4.10	...	...
17	.313	.433	.683	.5078	52.2	54.7	42.8	48.83	+13.03	.337	.200	.168	.233	86	46	61	67	S W b S	W	N W	N 88 W	11.2	30.4	12.5	12.95	15.15	...	...
18	.759	.775	.756	.7675	37.8	42.1	36.3	38.07	+ 2.58	.165	.143	.168	.163	72	53	78	71	N N W	N b W	N	N 11 W	4.0	6.0	2.2	3.97	4.06	...	...
19	.792	.836	—	—	32.7	43.5	—	—	—	.143	.186	—	—	76	66	—	—	NW b N	E	S S W	S 34 W	1.6	4.2	4.7	1.34	4.54	...	...
20	.849	.722	.660	.7347	37.1	40.3	41.4	39.77	+ 5.00	.158	.150	.214	.177	71	59	81	71	S E b S	E b S	E S E	S 73 E	8.3	14.8	8.5	8.72	9.27	...	...
21	.576	.466	.372	.4597	42.1	39.2	34.5	38.30	+ 3.92	.223	.216	.183	.206	83	90	91	89	E N E	N E	NW b N	N 30 E	6.4	12.5	5.8	6.89	9.25	0.290	0.1
22	.208	.129	.182	.1763	33.4	34.0	34.7	34.23	+ 0.15	.180	.180	.172	.177	94	92	85	89	N N W	N W	N W b W	N 41 W	6.8	15.8	17.0	14.57	14.75	...	0.5
23	.346	.475	.651	.5118	35.3	39.9	37.8	37.25	+ 3.58	.173	.181	.183	.177	84	73	80	80	N N W	N b W	N N W	N 22 W	14.2	15.0	9 2	11.40	11.56	...	...
24	.751	.786	.766	.7677	34.5	37.8	38.8	36.87	+ 3.60	.163	.173	.186	.171	82	76	78	78	N N W	NW b N	W b N	N 62 W	5.8	6.8	3.6	1.88	2.73	...	...
25	.683	.637	.714	.6833	37.1	42.5	40.3	40.02	+ 7.05	.182	.218	.185	.197	83	80	73	79	Calm.	W N W	N W b W	N 67 W	0.0	7.0	6.0	2.68	3.18	...	...
26	.747	.691	—	—	37.8	43.9	—	—	—	.190	.163	—	—	84	56	—	—	N W b W	W b N	N W	N 62 W	7.4	4.0	4.3	3.58	3.70	...	...
27	.561	.590	.784	.6590	32.7	37.4	27.7	31.93	— 0.25	.143	.154	.113	.137	76	69	74	76	W b S	N W	N W	N 52 W	3.2	33.0	2.5	11.66	12 52	...	Inp.
28	.843	.840	.778	.8192	24.4	29.8	25.9	26.95	— 4.93	.106	.133	.107	.119	81	80	76	80	N	Calm.	NE b N	N 51 E	4.5	0.0	4.2	4.28	5.08	...	...
29	.638	.542	.486	.5483	33.1	36.0	38.1	35.82	+ 4.32	.144	.147	.169	.155	76	69	74	74	E	S E b E	S	S 31 E	14.5	3.0	9.6	7.69	8.83	...	Inp.
30	.352	.053	28.962	.1058	39.2	43.5	38.8	40.47	+ 9.38	.190	.223	.204	.193	79	78	87	77	S b E	S E b S	S W	S 23 W	13.5	8.0	11.5	11.79	14.05	0.230	0.1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....	....	....	....	...	...	...	...	...	...	...
M	29.6743	29.6345	29.6485	29.6548	36.64	42.15	37.46	38.58	+ 2.43	.187	.192	.182	.186	83	70	79	77	....	....	....	....	6.68	10.65	6.88	......	7.90	0.975	1.1

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR NOVEMBER, 1865.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer..........................30.354 at 9 p.m. on 10th } Monthly range =
Lowest Barometer ....28.949 at 4 p.m. on 30th } 1.405 inches.

Self-regist'ing Thermom.
Maximum Temperature..........................63°2 on 17th } Monthly range =
Minimum Temperature..........................23°6 on 7th } 39°06
Mean maximum Temperature..........................44°85 } Mean daily range=
Mean minimum Temperature..........................32°91 } 11°94
Greatest daily range......24°2 from a.m. to p.m. of 13th.
Least daily range .... 4°0 from a.m. to p.m. of 22nd.

Warmest day.........17th...Mean temperature................48°83 } Difference = 21°88
Coldest day.........28th...Mean temperature................26°95 }
Maximum Radiation. { Solar.................................... 98°0 on 17th } Monthly range =
{ Terrestrial.................................... 9°0 on 22nd } 89°0
Aurora observed on 1 night, viz:—15th.
Possible to see Aurora on 11 nights; Impossible on 19 nights.
Snowing on 7 days; depth 1.1 inches; duration of fall 21.4 hours.
Raining on 5 days, depth 0.975 inches; duration of fall 31.7 hours.
Mean of cloudiness = 0.79.
Most cloudy hour observed, 2 p.m.; mean = 0.82; least cloudy hour observed, 8 a.m.; mean, = 0.74.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1985.43	1577.71	870.35	2979.06

Resultant direction N. 79° W.; Resultant velocity 2.98 miles per hour.
Mean velocity..........................7.90 miles per hour.
Maximum velocity..........................33.5 miles, from noon to 1 p.m. of 17th.
Most windy day......... 6th............Mean velocity, 18.62 miles per hour. } Difference=
Least windy day.........11th............Mean velocity, 2.25 ditto } 16.37 miles.
Most windy hour ...... noon ....Mean velocity, 10.98 ditto } Difference=
Least windy hour...... 3 a.m ....Mean velocity, 6.18 ditto } 4.80 miles.
1st. Solar halo, 3 p.m. Lunar halo, 6 p.m.
4th. Ground fog, a.m.
Well marked *Indian Summer*, 13 to 17th inclusive,
15th. Solar halo, 11 a.m.
25th. Dense fog, a.m.
28th. Lunar halo.

November, 1865, was warm and very dry—the quantity of rain being the least recorded during the series. The wind, both as to direction and mean velocity, closely approximated to the average of the previous 17 years.

COMPARATIVE TABLE FOR NOVEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	35.9	— 0.8	54.4	20.5	33.9	5	1.220	8	...	...	...	....
1841	35.0	— 1.7	63.2	7.6	55.6	8	2.450	5	...	...	...	0.91 lbs.
1842	33.3	— 3.4	50.6	7.6	43.0	9	5.310	10	...	...	...	1.22
1843	33.5	— 3.2	51.2	14.4	36.8	10	4.765	7	1.2	...	...	0.59
1844	34.9	— 1.8	49.8	12.0	37.8	8	Imp	4	8.0	...	...	0.48
1845	36.8	+ 0.1	58.8	7.6	51.2	7	1.105	4	5.0	...	...	0.53
1846	41.3	+ 4.6	55.5	18.2	37.3	12	5.805	2	0.4	...	...	0.64
1847	38.6	+ 1.9	58.2	7.8	50.4	14	3.155	3	Inap	...	...	0.36
1848	34.5	— 2.2	49.3	16.5	32.8	9	2.020	3	1.4	N 81° W	1.81	4.81 mls.
1849	42.6	+ 5.9	56.7	28.4	28.3	10	2.815	2	1.0	N 39° W	1.55	4.78
1850	38.8	+ 2.1	62.3	18.1	44.2	7	2.955	1	Inap	N 42° W	1.43	5.27
1851	32.9	— 3.8	50.1	16.5	33.6	5	3.885	6	6.7	N 50° W	1.25	4.70
1852	36.0	— 0.7	50.4	18.7	31.7	7	1.775	3	2.0	N 59° W	1.53	6.50
1853	38.7	+ 2.0	54.1	14.4	39.7	15	2.425	6	2.7	N 9° W	0.55	5.52
1854	36.8	+ 0.1	54.9	15.1	39.8	13	1.115	4	1.3	W	3.44	7.54
1855	38.6	+ 1.9	54.1	18.7	35.4	8	4.590	6	3.0	N 66° W	3.18	10.81
1856	37.4	+ 0.7	56.4	22.8	33.6	10	1.375	9	9.5	S 85° W	2.95	8.75
1857	33.5	— 3.2	57.8	— 2.3	60.1	14	3.235	9	6.9	S 61° W	5.45	9.25
1858	34.2	— 2.5	52.0	20.5	31.5	12	3.879	13	4.0	N 25° W	3.14	8.87
1859	38.9	+ 2.2	61.0	24.1	36.9	12	5.193	9	0.6	N 81° W	3.39	9.65
1860	37.9	+ 1.2	62.7	14.0	48.7	12	2.569	8	1.9	S 89° W	4.95	11.02
1861	37.1	+ 0.4	51.5	25.1	26.4	14	4.294	8	3.2	N 46° W	1.94	7.44
1862	35.6	— 1.1	58.0	17.2	40.8	11	2.205	11	5.3	N 46° W	3.00	6.60
1863	39.1	+ 2.4	57.6	19.4	38.2	13	3.650	6	0.1	N 88° W	3.50	7.86
1864	36.9	+ 0.2	56.5	21.9	34.6	11	3.765	8	4.5	S 72° W	3.82	7.64
1865	38.6	+ 1.9	55.8	24.4	31.4	5	0.975	7	1.1	N 79° W	2.98	7.90
Results to 1864.	36.75	...	55.48	16.19	39.29	10.2	3.148	6.2	3.12	N 78° W	2.43	7.47
Excess for 1865.	+ 1.85	...	+ 0.32	+8.21	— 7.89	— 5.2	— 2.173	+ 0.8	— 2.02	....	...	+ 0.43

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—DECEMBER, 1865.

Latitude—43 *deg.* 39 *min. North. Longitude*—5 *h.* 17 *min. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A. M.	2 P. M.	10 P.M.	Result'.	ME'N		
1	29.041	29.184	29.379	29.2297	33.1°	34.5°	33.4°	33.43°	+ 2.65°	.168	.148	.170	.160	89	74	89	84	SW b W	W b S	SW b W	S 65° W	11.2	13.6	6.2	10.19	10.68	...	inap.
2	.384	.214	.344	.3192	36.3	40.3	38.5	37.65	+ 7.17	.168	.150	.173	.166	78	59	74	73	S S E	E	Calm.	N 83 E	7.4	6.2	0.0	3.32	4.98	...	...
3	.617	.669	—	—	32.7	38.8	—	—	—	.156	.204	—	—	85	86	—	—	Calm.	NE b E	E N E	N 65 E	0.0	8.4	12.4	6.39	6.60	0.505	...
4	.459	.626	.832	.6658	41.7	46.8	38.1	41.72	+11.93	.264	.225	.187	.222	100	70	81	83	Calm.	W N W	NW b W	N 59 W	0.0	27.0	15.5	11.47	12.25	0.055	...
5	30.031	.984	.945	.9870	26.2	34.2	28.4	29.25	— 0.12	.096	.094	.119	.101	67	47	76	63	N	W	W	S 84 W	8.6	13.0	2.0	3.34	3.89	...	...
6	29.874	.692	.494	.6735	23.3	37.4	32.4	31.58	+ 2.52	.102	.135	.160	.136	82	60	87	76	Calm.	S W b S	Calm.	S 61 W	0.0	5.4	0.0	1.72	2.08	...	...
7	.296	.477	.781	.5382	33.8	30.9	23.0	28.70	+ 0.03	.144	.096	.086	.108	75	55	69	67	NW b N	N W	W b N	N 55 W	0.2	31.2	11.5	14.83	15.65	...	...
8	.867	.926	.961	9230	24.4	32.0	27.0	27.78	— 0.68	.110	.106	.121	.114	84	58	82	76	W S W	W	Calm.	S 89 W	8.2	13.2	0.0	4.09	4.21	...	0.2
9	.872	.562	.465	.6167	26.2	35.2	34.5	32.05	+ 3.90	.131	.136	.192	.160	92	66	96	88	N b E	S E b E	W S W	S 11 E	2.4	11.0	5.6	4.10	9.12	...	1.0
10	.508	.440	—	—	32 4	35.1	—	—	—	.161	.158	—	—	87	77	—	—	SW b W	S S W	S S W	S 35 W	6.0	3.8	5.8	4.82	5.14	...	...
11	.535	.555	.520	.5393	37.1	42.0	39.2	39.15	+11.50	.200	.204	.199	.199	90	73	83	83	S W	S S W	E	S 82 E	1.2	4.6	7.6	4.77	6.28	0.045	...
12	.428	.301	.578	.4560	42.5	50.4	34.5	41.55	+14.20	.244	.299	.148	.232	89	81	75	85	E	S b W	W S W	S 47 W	12.0	6.6	23.0	8.94	13.27	inap.	...
13	.886	.916	.941	.9218	23.3	27.3	20.5	23.70	— 3.45	096	.076	.081	.087	76	51	73	69	SW b W	W b S	W b N	S 73 W	11.8	8.5	1.5	7.56	7.81	...	...
14	.864	.885	.885	.8803	19.0	13.2	15.1	15.22	—11.75	.085	.047	.062	.063	82	60	71	71	W S W	W b S	W b S	S 74 W	11.2	19.3	17.6	16.13	16.36	...	inap.
15	.885	.861	.907	.8867	12 5	19.4	7.1	12.82	—13.95	.067	.049	.053	.058	88	45	88	76	W	W b S	Calm.	S 84 W	13.2	14.0	0.0	6.61	6.67	...	...
16	.883	.798	.706	.7893	8.2	20.8	19.4	16.32	—10.25	.046	.077	.093	.074	73	69	90	78	Calm.	S b E	S S E	S 38 E	0.0	10.0	1.5	3.40	3.88	...	0.2
17	.727	.770	—	—	16.5	27.0	—	—	—	.076	.107	—	—	83	73	—	—	E	S E b S	Calm.	S 54 E	3.0	2.8	0.0	0.80	1.20	...	inap.
18	.882	.766	.493	.6942	27.3	33.4	34.2	31.72	+ 5.55	.118	.149	.180	.153	79	78	91	85	Calm.	S E b E	S E b E	S 58 E	0.0	7.6	2.6	3.17	3.67	0.100	0.2
19	.243	.213	.469	.3232	36.3	39.6	31.3	35.03	+ 8.97	.210	.160	.136	.163	98	64	77	78	S E b E	W b S	W	S 89 W	1.5	19.0	23.5	15.57	16.75	...	inap.
20	.724	.674	.109	.4598	21.2	19.5	16.1	19.15	— 6.73	.092	.066	074	.080	81	63	83	78	W	NE b N	N E	N 27 E	4.5	9.2	19.4	9.98	13.03	...	3.5
21	.227	.561	.729	.5297	10.4	20.1	18.3	15.78	—10.00	.055	.059	.068	.062	78	55	68	69	W N W	W N W	SW b W	S 88 W	16.2	18.6	13.5	12.17	13.42	...	...
22	.685	.720	30.085	.8490	12.9	15.8	5.7	12.35	—13.33	.063	.054	.047	.059	80	59	82	77	SW b W	W b S	Calm.	S 64 W	15.6	4.4	0.0	5.41	5.4	...	...
23	30.125	30.085	29.800	.9860	11.1	16.7	24.4	17.13	— 8.43	.065	.067	.117	.082	92	73	89	83	SW b W	W S W	S E	S 25 W	5.0	4.6	3.8	2.45	3.08	...	...
24	29.413	29.238	—	—	36.3	37.0	—	—	—	.193	.150	—	—	90	67	—	—	S S W	S W	S W b S	S 40 W	5.0	0.5	0.8	2.32	2.35	...	...
25	.240	.398	—	—	21.5	36.0	—	—	--	.177	.180	—	—	89	75	—	—	SW b W	Calm.	W S W	S 47 W	3.2	0.0	0.3	1.38	1.38	...	...
26	.505	.392	.350	.3973	33.8	37.8	36.3	36.45	+11.15	.175	.217	.210	.205	90	95	98	95	Calm.	Calm.	Calm.	N 38 E	0.0	0.0	0.0	0.41	0.60	0.810	...
27	.210	.631	.840	.5900	36.3	37.1	28.4	34.05	+ 8.77	.210	.166	.134	.172	98	75	86	87	...	...	...	...	...	...	...	...	...	0.212	...
28	.802	.642	.742	.7297	30.6	32.0	32.0	31.88	+ 6.75	.144	.166	.166	.157	85	91	91	87	NE b E	N N E	SW b W	N 68 W	2.0	0.5	6.0	3.34	4.65	...	0.1
29	.956	30.062	30.082	30.0347	28.0	24.1	21.2	24.48	— 0.68	.139	.093	.085	.104	90	72	75	78	NW b W	N b E	N E	N 23 W	2.0	6.6	4.0	1.82	7.73	...	inap.
30	.942	29.802	29.887	29.8817	27.0	23.3	23.0	23.75	— 1.42	.129	.110	.098	.109	88	87	79	85	E	N E	N E b E	N 50 E	9.0	11.0	4.5	7.51	7.66	...	...
31	.886	.716	—	—	21.5	36.0	—	—	—	.102	.129	—	—	88	61	—	—	NE b E	S	S W b S	S 18 W	4.0	10.0	11.7	9.01	10.18	...	...
M	29.6642	29.6612	29.6930	29.6761	26.50	30.58	26.48	27.71	+ 0.62	.133	.126	.126	.129	85	67	82	79	......	......	......	......	5.48	9.69	6.68	...	7.33	1.727	5.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR DECEMBER, 1865.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 30.151 at 8 a.m. on 23rd. } Monthly range=
Lowest Baromoter . . . . 28.926 at midnight on 20th. } 1.225 inches.

Self-registering Ther.
Maximum Temperature . . . . . . 54°.2 on 4th. } Monthly range=
Minimum Temperature . . . . . . 5°.7 on 23rd. } 48°.5
Mean Maximum Temperature . . 34°73 } Mean daily range=11°41
Mean Minimum Temperature . . 23°33 }
Greatest daily range . . . . 30°6 from p.m. of 22nd to p.m. of 23rd.
Least daily range . . . . 3°2 from a.m. to p.m. of 20th.

Warmest day . . . . 4th...Mean Temperature . . . 41°72 } Difference=29°.37
Coldest day . . . . . 22nd...Mean Temperature . . . 12°35 }

Maximum Radiation. { Solar . . . . 94°0 on 7th. } Monthly range=
{ Terrestrial . . . . —6°0 on 16th. } 100°.0

Possible to see Aurora on 13 nights; impossible on 18 nights.
Snowing on 11 days; depth 5.2 inches; duration of fall 39.6 hours.
Raining on 7 days; depth 1.727 inches; duration of fall 33.1 hours.
Mean of cloudiness=0.73; most cloudy hour observed, 4 p.m.; mean=0.82; least cloudy hour observed, 10 p.m.; mean=0.63.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1050.71	1397.97	1062.47	3241.48

Resultant Direction, S. 81° W.; Resultant Velocity, 3.07 miles per hour.
Mean Velocity, 7.33 miles per hour.
Maximum Velocity, 34.0 miles, from noon to 1 p.m. on 7th.

Most windy day, 19th—Mean velocity 16.75 miles per hour. } Difference,
Least windy day, 26th—Mean velocity 0.60 miles per hour. } 16.15 miles

Most windy hour, 1 p.m.—Mean velocity 10.50 miles per hour. } Difference,
Least windy hour, 6 a.m.—Mean velocity 5.46 miles per hour. } 5.04 miles

4th. very dense fog, 11th. Solar halo. 13th. Solar halo and parhelia.
23rd. Lunar halo. 26th. Fog at night. 28th. Lunar corona at 8 p.m.
29th. Lunar corona at 6 p.m. No Aurora observed during the month.
17th. Bay frozen over; broke up with the change of wind on the following day.

December, 1865, was comparatively warm and calm. As regards moisture, although the quantity of rain was above the average, the snow was so much less as to make the month a very dry one.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum observed.	Minimum observed.	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	24.3	— 1.9	41.0	—4.4	45.4	3	Inapp	18	...	...	...	...
1841	28.7	+ 2.5	45.5	2.4	43.1	7	6.600	5	...	...	...	1.33 lbs
1842	24.7	— 1.5	40.3	3.8	36.5	3	0.880	17	...	...	...	0.61 "
1843	30.0	+ 3.8	41.1	2.7	38.4	6	1.040	8	8.1	...	...	0.53 "
1844	28.2	+ 2.0	48.9	—0.8	49.7	6	imper	6	4.2	...	...	0.40 "
1845	21.1	— 5.1	37.6	—2.7	40.3	2	Inapp	12	4.7	...	...	0.70 "
1846	27.5	+ 1.3	49.2	3.7	45.5	5	1.215	9	6.0	...	...	0.57 "
1847	30.1	+ 3.9	50.0	6.6	43.4	7	1.185	8	6.8	...	...	0.35 "
1848	29.1	+ 2.9	49.1	0.6	48.5	7	2.750	7	16.5	S 83 W	1.12	5.44 ms
1849	26.5	+ 0.3	41.3	—5.2	46.5	5	0.840	12	9.6	N 82 W	2.56	6.23 "
1850	21.7	— 4.5	48.3	—9.7	58.0	2	0.190	18	29.5	N 44 W	2.93	7.40 "
1851	21.5	— 4.7	43.8	-10.5	54.3	6	1.075	15	10.7	N 82 W	4.00	7.37 "
1852	31.9	+ 5.7	51.0	13.9	37.1	7	3.995	10	20.1	S 69 W	1.03	6.54 "
1853	25.3	— 0.9	42.2	—5.2	47.4	4	0.625	13	22.3	N 35 W	2.39	4.98 "
1854	21.9	— 4.3	41.8	—5.9	47.7	5	0.590	12	17.2	N 44 W	4.30	8.56 "
1855	26.8	+ 0.6	45.0	—2.1	48.0	6	1.845	10	29.5	S 88 W	5.29	11.38 "
1856	22.9	-- 3.3	41.2	—9.1	50.3	6	1.790	20	16.3	S 87 W	4.62	11.56 "
1857	31.9	+ 5.7	45.6	5.7	39.9	7	3.205	14	9.0	N 89 W	2.50	6.84 "
1858	27 4	+ 1.2	43.6	5.0	38.6	11	1.657	18	10.4	N 78 W	1.66	9.36 "
1859	17.9	— 8.3	54.8	—3.3	58.1	3	1.035	23	37.4	N 53 W	4.29	10.77 "
1860	24.0	— 2.2	38.5	—7.0	45.5	3	1.362	21	13 5	N 62 W	4.66	10.14 "
1861	31.1	+ 4.9	55.1	5.7	49.4	6	0.560	8	6.8	N 72 W	3.50	7.96 "
1862	28.8	+ 2.6	50.0	—2.3	52.3	5	1.945	8	10.4	N 73 W	3.17	7.58 "
1863	27.0	+ 0.8	51.5	1.0	50.5	10	2.960	17	7.1	N 41 W	1.61	9.40 "
1864	24.7	— 1.5	46.8	—2.3	49.1	9	2.045	18	27.1	S 82 W	4.94	9.98 "
1865	27.7	+ 1.5	50.4	5.7	44.7	7	1.727	11	5.2	S 81 W	3.07	7.33 "
Results to 1864.	26.20	...	45.76	—0.78	46.54	5.6	1.641	13.1	14.69	N 71 W	2.97	8.32
Exc. for 1865.	+1.51	...	+4.64	+6.48	—1.84	+ 1.4	+ 0.086	— 2.1	— 9.49	...	...	—0.99

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THE

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THE CANADIAN JOURNAL.

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No. LXII.—APRIL, 1866.

ON THE AMOY COLLOQUIAL DIALECT.

BY W. HENRY CUMMING, M.D.

(*Read before the Canadian Institute,* 31*st March,* 1866.)

This dialect is spoken in the city of Amoy and the surrounding districts. Dr. Medhurst, in his Dictionary (printed at the Honorable East India Company's Press, Macao, 1832) calls it the Fuh Kien Dialect. But as the province of Fuh Kien, though one of the smallest, has at least five distinct dialects spoken within its borders, and as the dialect under present consideration is not that spoken in and around the provincial capital Fuh Chau Fu, it seems scarcely entitled to the name. It has been also called the Chang Chau dialect from the city of Chang Chau Fu, about twenty-five miles S.W. of Amoy. This city, containing about four hundred thousand inhabitants, is the capital of the district in which the dialect is spoken called by Dr. Medhurst, the Fuh Kien dialect. This dialect differs, in some of its tones, as well as in very many words, from that spoken in Amoy. As too, Amoy is not in the district of Chang Chau, but in that of Tsiuen Chau, and as the Tsiuen Chau peculiarities are for the most part found in the speech of the Amoy people, the name of this latter district might more appropriately be given to this dialect. I have preferred, however, to call it the Amoy dialect, as that is the place best known to Europeans, it being the port of both those districts.

Amoy or Hia Mun (the harbour or gate of Hia) is situated in latitude 24° 40′ N., and longitude 118° 20′ E., upon the south-western corner of the island of Amoy, at the mouth of the Dragon river. At the beginning of the 18th century it was the seat of a large foreign commerce. It contains about 180,000 inhabitants. The two districts in which this dialect is spoken, contain two or three millions. The Chinese population of the island of Tai Wan or Formosa, estimated at two and a half millions, speak, for the most part, this dialect. So that within the limits of China proper it is the language of four or five millions.

But this dialect is not limited by the bounds of the Chinese Empire. The emigration from China to the islands of the Archipelago and to the south-eastern peninsula of Asia is composed of men from the districts where this dialect is spoken. The Fuh Kien men have been for centuries known as the mariners of China. Their junks have visited Bankok, Malacca, Sumatra, Java, Borneo, and many of the islands. These junks are almost all of them owned in Amoy. The inhabitants of this region know that within eight or ten days sail of Amoy, there lie large, fertile, unsettled regions, where starvation is unknown. Tens of thousands, finding themselves unable to obtain subsistence in the midst of a dense population, leave their country to seek their fortunes in less densely peopled and more fertile lands. They have carried with them their language, and thus the Amoy dialect is spoken by hundreds of thousands of Chinese emigrants in Bankok, Batavia, Borneo, and Singapore.

Hence the estimate does not seem extravagant that this language is spoken by five millions of people in these several regions.

A Spoken, and not a Written Language.

In China there is but one written language and this is identical in all parts of the Empire. This written language is not spoken, nor can it ever become a spoken language. It can not even be read aloud so as to be intelligible to an audience of cultivated men. The written language addresses itself to the eye and not to the ear. On the other hand, the spoken languages being unwritten, address themselves to the ear alone. Their range or area, unlike that of the written language, is very narrow, embracing only a few hundred square miles, and being used by only a few millions of people. It is not known how many distinct dialects exist within the limits of the eighteen provinces, but it is probable that there are more than one hundred. In the province of Fuh Kian there are at least five, each one unintelligible in all other districts.

There was a time when the European languages were deemed unfit for the use of learned men, and when all books were written in Latin, so that a man who could not read Latin was shut off from all the literature of the age. Whatever then might be a man's native language, it was necessary for him to learn to read Latin. This is the case in China at the present day. No books are to be found in one's mother tongue; the language of books must be acquired by long and patient study. But, unlike the Latin, the written language of China can neither be read aloud intelligibly, nor spoken. There are so few sounds in this monosyllabic language, that the name and sound of a character give no certain clue to its meaning. By the people of the different provinces the names of the characters are uttered so differently that they are unintelligible to each other. The literati of China have therefore no spoken language adapted to their use in conversation on elevated subjects. The Chinese scholar gives and receives instruction solely from the printed page. If conversation on topics of science or literature be attempted, the defects of the spoken language are supplemented by the introduction and interpolation of well known and trite citations from the books. Some "book-phrases" have thus become a part of the ordinary colloquial language of the common people and are perfectly understood by all. Other phrases, less frequently cited among the uneducated, are in constant use among the literary, and serve to make up for the meagre vocabulary of the colloquial dialect. Chinese pedants employ so many of these "book-phrases" in their ordinary conversation that they are not understood by men of considerable literary culture.

The Mandarin or Court Dialect, the only common language throughout China.

For many centuries Nankin was the capital of China, and its spoken language has maintained to the present day its position as the court dialect of the whole Empire. A Chinese, who can read the books with the Nankin pronunciation of the characters, and can speak the Nankin colloquial, may converse freely on any subject with men of like training from any part of the Empire. The Chinese officers, and indeed those seeking official positions, all speak this dialect, without a knowledge of which it is impossible that they can converse with their superiors or inferiors. This dialect, thus constantly employed in conversation of an elevated character, has probably been improved to the extent of its capabilities, but even thus it is but ill-fitted for its work. Notwithstanding all the additions received from the written language, it is still too meagre in its vocabulary; and its want of inflections is fatal to accuracy of structure and clearness and precision in style.

The Amoy dialect has never received this special culture bestowed upon that of Nankin, and is therefore every way inferior in fulness and even in perspicuity. Fewer "book-phrases" have been introduced into common use, and it is therefore much less fitted for elevated conversation.

Phonetic Elements of the Amoy Dialect.

The consonant sounds of the Amoy dialect are, for the most part, readily represented by Roman letters with their English utterance. They are B, Ch (as in "Church"), Chh (or Ch aspirated), G (as in "Gog"), H, J, K, Kh (aspirated K), L, M, N, Ng, P, Ph (aspirated P), S (as in "sister"), T and Th (aspirated T). The vowel-sounds are A (as in "father"), E (like A in "fate"), I (like E in "mete"), O (as in "note"), Ȯ (like "awe" or au in "author"), U (like O in "prove"). The compound vowel-sounds are ai (much like I in "fine"), au (like ou in "house"), ia (like ya in "yard"), io (like yeo in "yeoman"), iö (like yaw in "yawl") and iu (like "yew"). K, M, N, Ng, P and T, are either initials or finals; B, Ch, Chh, G, H, J, Kh, L, Ph, S and Th, are always initials.

The twenty-nine monosyllables under the initial B:

Ba
Bai
Bak
Ban
Bang
Bat
Bau
Be
Bek
Beng
Bi
Bia
Bian
Biat
Biau
Bin
Bio
Bit
Biu
Bo
Boe
Bö
Bök
Böng
Bu
Bua
Buan
Bun
But

A, I, Ȯ, are often nasalized, thus giving three new elementary sounds; Iu is also nasalized.

Besides the aspirated vowels (indicated by an H prefixed), there are four consonants aspirated (Ch, K, P and T). These must be distinctly marked by an aspiration preceding the following vowels, thus:—A, Ha; Ta, Tha; Pa, Pha; Ka, Kha; Cha, Chha.

There are not more than seven hundred monosyllables in the Amoy dialect. An Orthoepist trained in Europe would recognize only *seven hundred words.*

It is evident that conversation cannot be maintained with so small a number of words. The truth is, that there are several thousand monosyllabic words in this dialect.

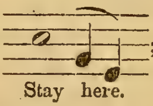
Under the initial "B," it has been stated that there are twenty-nine monosyllables, and yet there are at least 181 distinct, separate, intelligible monosyllabic words beginning with "B." Of these 76 are nouns, 43 verbs, 22 adjectives, and 40 others.

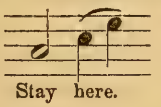
Under the initial "T," there are 43 monosyllables, and yet there are at least 448 words, viz.: 186 nouns, 175 verbs, 46 adjectives, 18 adverbs, and 10 others.

Under the initial "Th," (aspirated "T"), there are only 39 monosyllables recognizable by a European ear, yet there are 223 distinct, monosyllabic words, viz.: 66 nouns, 117 verbs, 18 adjectives, &c.

Under these three initials (B, T, Th,) then, there are only 111 monosyllables orthographically indicated, and yet there are 852 distinct monosyllabic words, *i.e.* about eight words to each monosyllable.* If this proportion be maintained through the whole number of initials, it will give more than 5000 distinct monosyllabic words in the language with only 700 monosyllables. There are probably more than 7000 words.

Let us proceed to show how these numerous monosyllables are uttered, so that they may be readily distinguished from each other.

"Stay here;" Stay here?" are similar combinations of precisely the same letters. They may even be said to be *pronounced* alike, but when properly *uttered,* they are perceived to be very different. The one is a command, "Stay here;" the other is a remonstrance against the command. They are at once distinguished not by a difference of *pronunciation* (in the usual acceptation of that word), but by a difference of modulation. The command is modulated thus, 

; the other is 

The word "Go" may be uttered with

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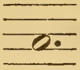
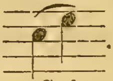
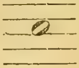
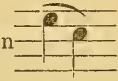
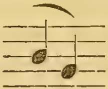
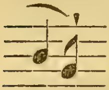
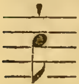
* These numbers are taken from an unpublished vocabulary of the Amoy dialect. The number of words is probably much greater than here given. The number of syllables is exact.

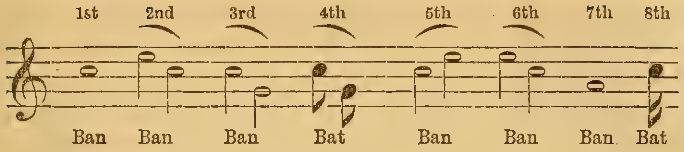
these two modulations  Go.  Go? . In the former case it is an order, in the latter a question. In the Amoy dialect the monosyllable "go" with the former tone means "to starve," with the latter modulation it means "goose." The former represents the seventh Amoy tone; the latter, the fifth. Take the monosyllable "Kau" (pronounced like our English word "Cow"); with the seventh tone, it means, "thick;" with the fifth tone, "monkey." But these are not all the tones and modulations that are used. The word "Kau" may be uttered in a high monotone, thus  Kau. ; this means "a ditch."

It may have the following modulation  ; it then means "a dog."

It may be thus modulated  and then it means "enough."

If uttered with the same modulation, but in a quick, abrupt manner  it meams "to decompose." These are severally styled the first, second, third, and fourth tones; they are also called *upper* tones. The fifth and seventh tones have been already described. In the Amoy dialect the sixth tone is the same as the second. The eighth tone is a high monotone, very qnickly and abruptly pronounced, thus  Kau. The fourth and eighth tones are called by the Chinese, the upper and lower "entering" tones, Where the words end in "m," the "entering" tones have the "m" changed into "p;" thus "lam" becomes "lap." If the word end in "n," the "entering" tone changes "n" to "t;" thus "lan" becomes "lat." If the word ends in "ng,', the "entering" tone changes "ng" into "k;" thus "lang" becomes "lak," "leng" becomes "lek," "löng" becomes "lök," "liöng" becomes "liök."

Let us now examine these several modulations in their relations to each other. We take the word "Ban."



The tones are indicated in various ways by different writers. The most readily recognized and most readily printed mode is the employment of the several accents—the acute, the grave, the circumflex, the long, and the staccato. By this method, the word "Ban" would be thus written in the several tones: Ban, Bán, Bàn, Bat; Bân, Bán, Bān, Ba̍t. In the cases of the first and fourth tones, no mark is used. Where the word ends in a vowel, the abrupt ending of the "entering" tones is indicated by affixing the letter "h;" thus the word "Ba," written in the several tones would be: Ba, Bá, Bà, Bah; Bâ, Bá, Bā, Ba̍h.

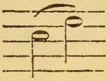
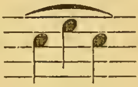
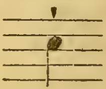
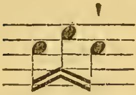
The significations of a monosyllable in its several tones bear no relation whatever to each other. Thus the word "Ke" (pronounced like "Kay" in English) has the seven following meanings in its seven distinct tones:—

1. Ke—a family.
2. Ké—false.
3. Kè—a plan
4. Keh—to divide.
5. Kê—the caugue.
7. Kē—low
8. Ke̍h—to oppose.

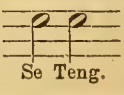
1. Si—silk.
2. Sí—to die.
3. Sì—four
4. Sih—to twinkle.
5. Sî—a season.
7. Sī—to be.
8. Si̍h—to lose.

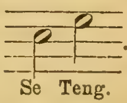
It thus appears that a monosyllable may, by these different tones, be transmuted into as many different and distinguishable words. In the written Chinese language there are eight tones, four upper and four lower. In the Nankin, or Court Dialect, there are, however, really only five different tones and modulations in use, the sixth tone being the same to the ear as the second, the seventh as the third, the eighth as the fourth. In the Canton and Fuh Chau dialects, there are eight different tones. These tones are not the same in the different dialects. Thus the Canton tones are different tones (musically considered) from those of the Amoy and Fuh Chau dialects. The Fuh Chau tones are several of them peculiar. The five tones of the Court dialect are all to be found in the Amoy, but attached to different numbers. The first and second of the Court dialect are identical with the corresponding numbers in the Amoy. But the third tone of the Court dialect is identical with the fifth of the Amoy; the fourth of the former with the eighth of the latter; the fifth of the former with the third of the latter. Thus the third and fifth tones of these two dialects have interchanged modulations.

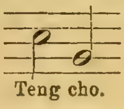
While there is such a resemblance between these two distant dialects (the Court and the Amoy), the neighbouring ones of Canton and Fuh Chau are very unlike to each other and to the intermediate Amoy.

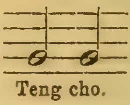
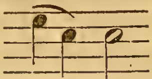
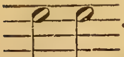
A still more striking difference in intonation is to be found in the two conterminous districts of Chang Chau and Tsiuen Chau. The people of these two districts understand each other very well, the words being for the most part identical. Yet of the seven tones used, three are unlike in these adjoining districts. The first, second, third and seventh tones are identical in the two. But the Chang Chau fourth is identical with the Tsiuen Chau eighth, and the Chang Chau fifth and eighth are wholly unknown to the Tsiuen Chau. Their fifth tone is not  but , and the eighth not  but . Of course the Tsiuen Chau fourth is not known to them. A collection of all the various distinct modulations to be found in the eighteen provinces of China would doubtless be of great interest.

The difference in the modulation of the Fuh Chau, Amoy, Chang Chau and Canton tones is so great that a practised ear can determine which of these dialects is spoken on the deck of a vessel at such a distance that not a single articulation can be distinguished.

But there are also *composite* tones. Thus, a tone usually undergoes some modification when the word, of which it forms a constituent, is united with another word, to form a compound word of two syllables. Thus, "se" is "gauze" and "teng" is a lantern; but a gauze lantern is not pronounced 

but 

. So, again, "teng chō," a "lantern stand," is not 

but  a first and a seventh tone thus being changed into two seventh tones. "Tháng teng," a "cask-shaped lantern," is not uttered with a second and first tone, but with two first tones; not  Tháng teng. but  Tháng teng. These are given as instances of the changes in the tones resulting from the formation of compound words. To a foreigner, the whole subject is very difficult.

Practical efficiency of tonal distinctions.

This entire contrivance of tones as an element of spoken language may, at first sight, seem not only clumsy and difficult but uncertain and impracticable—necessarily leading to mistakes and most serious misapprehensions. But this is not the case, and whatever our opinion of the cleverness and ingenuity of the expedient, there can be no doubt of its success. The whole system of tones is most disheartening to the foreigner attempting to learn to speak Chinese, and for a long time the task seems an impossible one, the tones being difficult of recognition and still more difficult of accurate utterance. Yet the little children learn them with the utmost exactness, and utter them most distinctly, never failing to give the proper modulation. Thus trained, the Chinese see in a tone not the *accident* of a monosyllable but a *constituent part.* The common people and even the educated men seem never to have analysed their words and recognised the *articulate* and the *tonal* elements. If the tone be wrongly uttered, the error is deemed as great as if the mistake had been one of articulation. To say "béng" (second tone) instead of "bêng" (fifth tone) is regarded as an error not less than it would be to say "têng" for "bêng." Indeed the use of a wrong initial element would be thought a lighter fault than a false modulation.

From these facts it is evident that to a foreigner endeavouring to acquire a Chinese spoken language, a musical ear is of the highest value. No mental qualification is of equal importance. The language is not otherwise difficult; its structure is simple and its vocabulary limited. But the inability to recognize the pitch of sounds and the intervals of different tones, is as fatal to success in the acquisition of a Chinese spoken dialect as deafness itself. In acquiring most languages the articulation must be caught, and if that be effected, the work is done. But in Chinese an element of fully equal value is the pitch of the tone with which the word is uttered or the nature and extent of the modulation. This want of ear (as it is called) has been a serious hindrance to many earnest men in their efforts to speak Chinese.

It must not be supposed that the absolute pitch of the tones is the same with all men, or even with the same man at different times. Different men speak on different keys; the same person speaks on different keys at various times and in various circumstances. So the tones are constantly varying in their absolute pitch with the variation of key, and yet bear to each other a fixed relation. So also the extent of the modulation varies with the emotions of the speaker. In tranquil utterance the range of modulation is usually a third, while in excited conversation it rises to a perfect fifth. Little children give a greater range to their modulations than adults.

Relation of the Amoy Tones to the ordinary tones of common utterance.

It will be observed that the Amoy Tones are such as we use in ordinary speech. Every one is employed in speaking English. But while in Chinese the tone is an essential and unvarying element of the word, in English it changes with the emotions of the speaker or the general drift of the sentence. Anger, fear, love, reverence, desire, pride, shame, and other feelings, determine our tones and modify them constantly. In speaking in an earnest, impassioned manner, the modulations are almost always appropriate and impressive. But in speaking Chinese, it is to be borne in mind that the very tones which seem to us so natural and expressive of our emotions, have been pre-engaged, and are already enlisted in the service of Orthoepy. As rhetorical powers, they no longer exist, having been impressed for the work of mere verbal enunciation. A European, in speaking Chinese, must therefore be ever on his guard, lest the habits of his youth carry him away, before he is aware, and the modulations be employed in the expression of emotion, which must be jealously reserved for the distinction of words. In public speaking, great care is requisite, lest the feelings of the orator ruinously modify his utterance and render unintelligible or absurd his most weighty sentences.

But the question may be asked "Have the Chinese then no tones of emotion?" No one can listen to an earnest altercation, without perceiving that there is no lack of emotional modulation. But these tones are different from those used in the utterance of words. Any one who has observed the great variety of intonations among the English, Scotch, and Irish, will be ready to admit the possibility of the Chinese finding enough for all their wants.

Distinction of Homophonous Words.

With 700 monosyllables varied by 7 tones, the Amoy dialect might comprise 4,900 distinct monosyllabic words. But these tones are not fully employed and consequently all these possible combinations do not exist. Some monosyllables have only one word instead of seven; others have two, three or four only. In consequence of this deficiency existing as to some syllables, others have far more than seven words in connexion with them—8, 10, 12, 15, 18, 20, 25, 27, and in one case, 30 words. In examining more minutely this last case (the monosyllable "To"), we find under the first tone, 4 words; under the second, 5; under the third, 5; under the fourth, 1; under the fifth, 11; under the seventh, 3; and under the eighth, 1. Under the fifth tone then there are 11 words precisely homophonous; uttered exactly alike; the nicest ear can recognize no difference among them. How can intelligible conversation be maintained amid such chances of misapprehension?

There is usually very little danger that a verb will be mistaken for a noun or adjective. If, however, there be several homophonous verbs or adjectives, there will be danger of confusion. In such cases perspicuity is obtained by the combination of two synonymous or nearly synonymous verbs or adjectives, if the context does not prevent misapprehension. In the case of like-sounding nouns, there is another expedient which is worthy of explanation.

The English phrase "He has twenty *head* of cattle," is perfectly intelligible. And yet it might be difficult to define the precise meaning, in that sentence, of the word "head." The sentences, "We saw ten head of ducks," "He caught ten head of fish." would be at once condemned as unidiomatic. A person familiar with Chinese grammar would describe the word "head" as the "numeral," "classative," or "classifier" of the word cattle, and declare it to be not the classifier of ducks or fish. If in English it were customary to say not only "head of cattle," but also "tails of fish," "sticks of masts," "sheets of sails," "bows of anchors," &c., the expedient, to which the Chinese have been driven by necessity, would be very fully illustrated. The nouns are seldom used without their appropriate classifiers. The numeral adjectives are not employed without the intervention of the classifiers. Thus they do not say "sì hî" (four fish), but "sì *bé* hî" (four *tails* fish), not "chit uî" (one mast), but "chit *ki* uî" (one *stick* mast). By this expedient many phrases are rendered readily intelligible, which would otherwise be hopelessly confusing. These classifiers are not only interposed between the numeral and the noun, but they follow the numeral, where the noun is not expressed but understood. Thus to the question "lí ū kúi *chiah* bé?" (how many horses have you?) the answer is "sì *chiah,*" (four head), not "sì" alone. These classifiers sometimes marshal strange groups. The same word is the classifier of chairs, tables, bedsteads, sails, wheel-carriages, wheeled instruments, curtains, bows, letters, (epistles), &c. Many of the groups, however, are quite natural.

Relations of the Words in the Written and Spoken Languages to each other.

The characters of the written language have different names in various parts of China. As the Arabic numerals, while conveying the same meaning to men of different nations, are yet called by entirely different names, so a Chinese character has different designations in various regions. The Nankin man calls certain two characters "Shih fan." They mean "eat rice." The Amoy man, looking at the same characters receives from them the same idea, "eat rice," but he names the characters "si̍t hūan." The tones are different, and so are the articulate elements. The Nankin spoken language follows very closely the sounds of the characters. "Shih fan" is not only the sound of the two characters, but it is the colloquial phrase for "eat rice." At Amoy, on the contrary, while the written expression is "sît hūan," the colloquial phrase is "Chi̍ah pn̄g."

From the following list it will be seen that many of the words are very unlike in the two languages.

English	*Written.*	*Spoken.*	*English.*	*Written.*	*Spoken.*
Man	Jîn	Lâng	Flower	Hua	Hoe
Horse	Má	Bé	Nine	Kíu	Káu
Foot	Kiak	Kha	Milk	Jú	Lin
Ship	Chhuân	Chûn	Thief	Che̍k	Chha̍t
Know	Ti	Chai	Wise	Hiân	Gâu
Sail	Hông	Phâng	Smoke	Ian	Hun
Fragrant	Hiang	Phang	Crockery	Chû	Hûi
Speak	Suat	Kóng	Eight	Pat	Poeh

Notwithstanding, there are a great many words identical in sound and meaning, in the two languages.

There is also a large class of words in the spoken language clearly derived, by slight and methodical modification, from the written.

English.	*Written.*	*Spoken.*	*English.*	*Written.*	*Spoken.*
Buy	Mái	Bóe	Wood	Bo̍k	Ba̍k
Sell	Māi	Bōe	Eye	Bo̍k	Ba̍k
Table	Tok	Toh	Ink	Be̍k	Ba̍k
Descend	Lo̍k	Lo̍h	Green	Lio̍k	Le̍k

In English dictionaries the derivation of the word "tea" is traced, through the French and Spanish languages, to the Chinese "tsha." This is the pronunciation of the character in the Nankin or Court dialect, and has evidently nothing to do with our word "tea." The true derivation is from the Amoy word "tê," (pronounced *tay*), which is the word used both in the written and spoken languages. The earliest European trade was with this port, and thus the Amoy name was introduced into the Western European languages. The Russians, on the contrary, obtaining their tea by land from the Northern part of China, call it "tshai," a word evidently derived from the Nankin dialect.

Syntax of the Amoy Colloquial.

In Chinese (both written and spoken), there are no inflexions. Verbs, nouns, adjectives, have no prefixes and affixes, no augments and reduplications, no marks of case, number, person. There is a particle "tè" which gives to the immediately following verb a present sense; thus, "tè lâi" means "are coming," "tè khì" means "are going." There is a word which, preceding a verb, gives it a future meaning; thus, "guá beh lâi," "guá beh khì" means "I will come," "I will go." The particle "là," following a verb, indicates the preterite; thus, "lâi là," "come," "khì là," "gone." The word "líau," following the verb, gives the idea of completeness to the past sense; thus, "chòe liáu," "thoroughly done," "chiàh liáu," "eaten all up." Another mode of expressing the preterite is by the use of the word "bat," "to know;" as, "guá m̄ bat khì," "I have never gone." The passive voice is sometimes expressed by the word "tit," "to get, to obtain." Thus, "bōe kóng," "cannot say," becomes "bōe kóng tit," "cannot be said."

Nouns do not change their forms, to express number or case. There is a genitive particle "ê" which follows nouns and pronouns. Thus "guá," "I," "guá ê," "my;" "i," "he," "i ê," "his;" "lán ê," "our," "lín ê," "your."

The pronoun "lí," "thou," has a true plural, "lín," the only instance probably in the language.

The adjective usually precedes the noun with which it is connected. When it follows the noun it becomes the predicate of a proposition, the substantive verb being omitted. Thus, "hó lâng" means "good man;" "lâng hó" means "man is good." "Gâu lâng," "wise man;" "lâng gâu," "man is wise."

The comparative degree is indicated by prefixing "khah;" thus, "hó," good; "khah hó" "better." The superlative is expressed by using particles meaning "very," "extremely."

There are, of course, adverbs, prepositions, conjunctions and interjections; these need no special notice.

On the Roman Orthography of the Amoy Colloquial.

The efforts of Sir William Jones to introduce a uniform mode of expressing, by means of Roman characters, the various sounds of Oriental languages, were much approved by European scholars. It seems to the literary world most desirable to have a single mode of writing ten, twenty, or even fifty different languages. But the fact is, either that the letters fail to designate the sounds with sufficient accuracy, or they become so burdened with diacritical marks, that the simplicity of the plan is lost. Besides, these diacritical marks are so tedious to the writer, so appalling to the printer, and so vexatious to the reader, that the utility of the entire plan is very questionable. To a resident of Amoy, it is important that the expression of the sounds of the Colloquial in the Roman character should be as phonetic and as simple as possible. And when it is considered that the great object in reducing it to a written form is, that it may be used by the masses of the people who know nothing of the Chinese written language, simplicity and phonetic efficiency are seen to be invaluable. It is hard that the letter "U" should be burdened with a diacritical mark likely to puzzle a Tsiuen Chau villager, merely because the unmarked letter has been already employed to express a different sound on the banks of the Indus. The interests of millions in China should not thus be sacrificed to the convenience of universal philologists.

But a special reason exists for being chary of diacritical marks for expressing the sounds of letters. In all Chinese writing or printing in the Roman character, tonal marks are indispensable. If the tones are not clearly indicated, the failure is complete. The advocates of the adoption of Sir William Jones' system recommended the Chinese mode of indicating the tones, a plan used in several works printed at Canton and Macao. The first tone-mark is a semicircle placed at the lower left-hand corner of a word; the second, at the *uppev* left-hand corner; the third, at the upper right-hand corner, and the fourth at the lower right-hand angle, The fifth, sixth, seventh and eighth, were indicated by the semicircle and a horizontal line, and corresponded in their positions with the first, second, third and fourth respectively. But this plan is burdensome to writer, printer, and reader. A far simpler plan and of ready employment is that of Medhurst, the father of the Fuh Kien Mission. The first tone is unmarked; the second has the acute accent; the third has the grave; the fifth, the circumflex; the seventh, the long [–] accent. The sixth tone is the same as the second, and needs no other mark; the fourth and eighth tones are distinguished from all the others by ending in h, p, k, or t; the eighth tone is distinguished from the fourth by a "staccato" mark.

The aspirated vowels are marked, not by a rough breathing, but by prefixing the letter "h." The consonant aspirates (ch, k, p and t) are indicated in the same way by the use of "h." The aspirated letters are written "chh, kh, ph, th."

The nasal sounds are indicated by a small "n" placed above the vowel.

The sound "awe" is expressed by a dot within the circle of the letter "O."

It is hoped that this short and very imperfect sketch of one of the spoken languages of China, will be of interest to some of the readers of the *Journal* of the Canadian Institute. The want of the proper type has greatly diminished the number of illustrations.

NOTES ON SOME PRACTICALLY INTERESTING QUESTIONS IN ECONOMICAL SCIENCE BEARING ON THE PROSPERITY OF COUNTRIES SITUATED AS OURS IS.

BY REV. WILLIAM HINCKS, F.L.S., ETC.,

(*Read before the Canadian Institute, 24th March,* 1866.)

I have had a good deal of doubt whether I ought to offer these notes to the Canadian Institute. I have nothing new to bring forward, and I pretend to no particular skill or knowledge on the subject. I have indeed studied it to some extent, and endeavoured, as I think all educated men engaged either in trade or professions ought, to understand its principles and their practical importance, but to repeat received and as I apprehend well-established principles in this place is what can only be excused under peculiar circumstances. My apology is, that I think I frequently observe symptoms of the prevalence, to some extent, in this country, of what I must account false, delusive and dangerous notions on great questions in economical science. This is probably not the case amongst thinking and reading men, but if we consider that the works on political economy are not in their nature popular, or in their price very accessible, as they offer no temptation for reprints, and that a very bad influence is constantly though imperceptibly flowing in from a neighbouring country where opinions and practices which set at defiance all the conclusions of science are almost universal it really is not wonderful that even intelligent and well-informed men amongst us should adopt notions in general circulation which have a certain degree of plausibility, though contrary to the conclusions which the highest authorities on the subject have deduced from the widest experience by the most cautious reasoning, which have come to be accounted as established truths, and have been practically applied with obvious advantage. As this is a case in which no one can doubt the importance of right views, and it is only by discussion and reflection on what can be said on both sides that they can be diffused, I must think it a useful labour to call attention to the subject, and that conviction must excuse an attempt which I can only hope to render tolerable by a direct reference in my observations to the sort of case presented by countries situated like our's in respect to the question discussed.

I rest with confidence on the fundamental principle that political economy is a *real science*, not consisting of the mere fancies and visionary theories of certain writers, but of knowledge concerning laws of nature which being unchangeable and universal in their operation, must be known that we may avoid the evils that must arise from their neglect, and that we may by acting in harmony with them make them promote our ends. If there were no natural laws in relation to wealth, its acquisition and distribution, there could be no science. If we misunderstand any existing laws, so far our principles are wrong and must be set right by further inquiry, but if, as we think, the knowledge of laws has been obtained, to go in opposition to them would be mere madness and folly. The first rude generalisations suggested by imperfect views of the facts can no longer be safely admitted as guides for practical measures. We must endeavour to follow the reasonings of those who have carried forward the science to its present advanced state, and unless we can prove them fallacious we ought to adopt the results as practical rules. My proposed part is to point out some instances in which popular prejudice is opposed to scientific reasoning, and to endeavour to make it plain that the latter is sound and good and ought to be our practical guide.

The first subject which it occurs to me to notice is the old—it might have been thought the exploded—fallacy of it being a great evil for money to go out of the country, or as the same thing is differently expressed, for the imports of a country to exceed its exports. This notion must depend either on the belief that money itself constitutes wealth, instead of being as it is now well known to be only one among the commodities valued, and being wanted only in a certain limited proportion; or on the fancy that importation injures home production, whereas it is manifest that there could be no importation excepting for the supply of wants, the means of payment for which supply must be procured by home industry; or from the assumption that it belongs to a certain clique to decide how the people shall employ their industry, and to demand from government means of preventing the public from seeking things abroad which they think should be prepared at home, whereas it is one of the most certain dictates of experience that individual self-interest is the safest and best guide, to what each man shall do, and it necessarily follows that the country flourishes most where every man produces what he can best produce and buys with his produce whatever he most desires whether at home or abroad. If it could be conceived that a whole people unitedly purchased supplies for its wants abroad by means of wealth previously acquired without any care about production, that nation would rapidly exhaust any imaginable accumulation of wealth and be reduced to abject poverty. But the thing is not to be conceived. The wealth of a nation is that of the individuals composing it. The trade of a nation is that separately carried on by all its citizens, and cannot be considered as one thing. There may be too many instances of rogues and dupes, but the rule is nevertheless plain enough that those cannot supply their wants who cannot give an equivalent which can only arise from present industry or from the accumulations of that which is past. Now he who labours has an indefeasible right to employ the produce of his industry as he pleases, provided he does not injure others, and it is a fair presumption that he will supply his wants wherever he can supply them best and cheapest, whether within certain geographical bounds or not, or in what manner or form, bullion or otherwise, what he has acquired by his industry goes to pay for what he desires, are matters falling within the control of no free or just government, and the attempt to control which cannot possibly produce good, though it may often produce great evil.

All things imported are so because being desired, they may be had cheaper or better from abroad than they could at home, supposing they could be had there at all, and what is thus saved by a cheap supply of wants is spent in other employments of industry, being a clear profit to the country.

As to a favourable balance of trade enriching a country, some nations as England for a long period had always a favourable balance, and that to a great amount, yet this caused no extraordinary accumulation of the precious metals in that country. Other nations have had a long continuance of what are called unfavourable balances, yet have been all the time advancing in civilization and material wealth, so that no judgment can be formed respecting the real condition of nations from the comparison of their imports and exports. It is quite conceivable that a small island might be occupied by a community of merchants and traders, whose industry was almost entirely expended in fetching and carrying for other nations; importing all that they wanted themselves, exporting next to nothing of their own producing. Yet that community might flourish and grow rich.

Commerce is an appointment of the All-wise and infinitely benevolent Author of Nature, for equalizing, as nearly as may be, the advantages of different climates, soils, mineral productions, and other variable circumstances in the world's condition, by each region sending the superabundance useless to itself, of what it best produces, to other parts, and obtaining in return what is there best produced, thus at once conferring and receiving blessings and extending civilisation, knowledge and enjoyment. The very principle of commercial exchange is that what is cheap in one place bears a high value in another, so that interchange enriches both, whilst paying well for the industry employed in carrying, and offering in the most convenient manner. There are two great errors respecting commerce not yet sufficiently removed from the popular mind: one, that what is gained by exchange is lost by one party to be gained by the other, whilst really each makes the most of what he has to dispose of, be it goods or circulating medium, which is but a commodity conveniently representing a command over a certain amount of goods of various kinds, and advantage to one party by loss to the other only occurs where fraud is practised or where mis-information has caused ill-judged proceedings. The other great error is, believing a nation to be the better off the more completely it can supply every thing within itself, which is called being independent of other nations; and it is even supposed to be an advantage and a sort of merit to do without what cannot be produced at home, or to be content with an inferior article, home-made, in preference to a better, imported. The real independence of nations consists in their industry giving them command of all desirable things from all quarters. That industry should be employed in whatever way seems likely to yield the greatest surplus above our own requirements. It is egregious folly to try and produce at home what we can obtain cheaper or better by exchange from abroad; and the fancy that such a proceeding can increase our national wealth, is a mere blunder. In a very rude state of society, individuals are obliged to do almost all things for themselves, and, in consequence, do most of them badly and with great loss of time. Division of labour is a grand means for increasing the quantity and improving the quality of all desirable things. Territorial division of labour—a most just and expressive name for commerce—has the additional advantage that, from the different natural productions above and under the ground, of different regions, it supplies us with many things which we could not possibly procure at home. Even different parts of the same country afford very different facilities for different kinds of industry, and it would be quite as reasonable for each of them, as for the whole, to resolve to do all things for itself. The principle, if good for anything, would really bring us back to the savage state. When a nation is led by peculiar advantages for that kind of work, to employ itself largely in manufacturing industry, it must of necessity, send a large part of its produce to other countries in exchange for food and for luxuries not to be procured within its own bounds; and also, for a common medium of exchange which the holders can use in purchasing from their neighbours such objects of desire as are to be obtained from them. In this case there is, of course, a favourable balance of trade. Suppose, on the other hand, that a nation is chiefly employed in drawing from a fertile soil, the various and abundant fruits of the earth, there will be also in the community many labourers, many artizans and manufacturers of such things as are advantageously made on the spot—many professional men rendering useful services, and many merchants and tradesmen introducing and distributing those articles which are best obtained from other countries. The farmer consumes his own required share of the produce of the soil, and of what he has over and above this he pays a part for labour and professional services, and a part for what he desires brought from other countries; if anything yet remains he puts it in the form most convenient for reserving it as capital. What goes into the hands of the professional man, is partly employed in purchasing services, and goods produced on the spot including a portion of the produce of the land, whilst a part goes to stimulate importations of foreign conveniences or luxuries; a portion also, in many cases being reserved as additional wealth or capital. What passes to the merchant or dealer is partly paid abroad for the commodities he introduces, the portion which forms profit being divided as already explained, between the purchase of produce of the land, of various services, of imported goods, and a portion added to capital, wherever prudence is joined with moderate success. Such a community is in a healthful and flourishing state, increasing from year to year in improvements, accumulations and enjoyments, and affording no pretence for any imputation of spending what it has no right to spend; yet, examine and you must perceive that its exports, consisting of the portion of its produce which is consumed neither by the producers nor by any of the classes employed by them, may be less in amount than the imports which are to satisfy the wants not only of those who work the soil, but of all who render them services or render each other services—each of them obtaining a share of the whole produce of industry, and using a portion of that share in obtaining what the country does not yield. So long as nobody buys what he has not by his industry, present or past, the means of paying for, it is a matter of indifference in respect of public prosperity, whether the portion of the results of industry which is exchanged for foreign produce, all go out in the form of produce or a part in the form of a medium of exchange obtained by some of the dealers in the imported article to represent what has been consumed by those around them. In such a country there may be an unfavorable balance of trade without any thing really to be complained of, or unfavourable to the prosperity of the community. In some way or other the industry of the inhabitants purchases whatever is consumed by them; but in the case last mentioned, exchanges within the country put a certain share of what goes to pay for imports in the form of circulating medium, and this without the least real injury to the country. It may even be connected with the greater diffusion of the rewards of industry, and the higher rates of wages and profits which prevail in a country yet yielding more produce of the soil than its inhabitants need, and depending more on agriculture, mining, and lumber, than on manufactures.

It is useless to proceed further with argument. The danger of an unfavourable balance of trade is a mere delusion depending on a false analogy between a nation and an individual, and wrong views respecting the nature of commerce, and it ought not to meet with the least attention in an enlightened age and country. The doctrine is so much opposed both to the opinions of all recent writers of any importance on political economy, and to that general good sense which would leave to every man the unrestricted disposal of the fruits of his own industry, and which believes nations not to thrive at each other's expense, but to have all one common interest, and each to prosper more in proportion to the prosperity of all the others, that it seems to me something like an imputation to say that it meets with any favour amongst us. I feel obliged, therefore, whilst appealing to your own knowledge of sentiments which are widely extended, to make a short extract from an influential and popular source of information, the general utility of which I myself estimate very highly, in order to convince you that I am not combating shadows. The Montreal

Trade Review, which we must suppose to have some support amidst the mercantile community of that great city, having expressed itself in the following words: "During the last ten or twelve years the consumption of the Province has outridden the production by many million dollars; indeed we have been running into debt at the rate of some eight or nine million dollars a year, as will be seen by reference to the provincial import and export account. To conceive that such a course can be forever pursued without producing national insolvency, would be to condemn, as unsound, the principles established by all the great writers on political economy. A colony—and especially a new and not wealthy colony—cannot afford, any more than an individual, to spend a dollar and only earn seventy-five cents, without ultimately coming to grief." This passage, mistaken in its facts and in its reasoning, and founded on ideas belonging altogether to the past, is quoted with the highest approbation in the Journal of the Board of Arts and Manufactnres for Upper Canada, the use made of it appearing from the following words: "It (the *Trade Review*) does not, as is the case with most of our polititał newspapers, point to the large imports of wholesale merchants as evidence of the country's prosperity, but warns the people that if we continue to import so largely in excess of our exports, as we have been doing for many years past, it will inevitably lead to national insolvency; and instead of depreciating the efforts of those who desire to make this a manufacturing as well as an agricultural country, as is the wont of many of our public writers, shows that it is utterly impossible for us to be prosperous unless we manufacture much more largely than we now do, and thus employ our surplus and unproductive labour, and *keep capital in the country.*"

It is pleasant to learn from this writer that the public press generally is too enlightened to sanction such fallacious and dangerous notions, but the occurrence of such a passage in a work of such authority as I have quoted, emanating from a Board constituted by the government and which must be acknowledged to have accomplished very much good in proportion to its means, and in its Journal to diffuse a great amount of practically useful knowledge, is quite enough to show that the discussion of these subjects is needed amongst us. The passage quoted leads us to another important question, the attempt to make this a manufacturing as well as an agricultural country. We must in the first place distinctly understand what this attempt means. No country whatever is exclusively engaged in agriculture.

There are many minor manufactories which are best carried on in the localities where their products are needed, and some more extensive ones will often arise from the skill and energy of individuals or the special facilities afforded for them. Cases may even occur in which a wise and far seeing people might offer some special encouragement in the way of bribe to a particular form of industry which seemed capable of being carried on with advantage, but was checked by preliminary difficulties. At the least where manufactures arise naturally, and can be carried on profitably, they are an advantage to any country, were it only by offering greater variety of industrial employment. Nevertheless what countries shall become great manufacturing countries or at what period they shall become so, depends on natural causes which cannot be forced, and any attempt to force them is at once unjust to the people at large who have to pay the price of the protection afforded, and unfavourable to the general prosperity. The usual conditions favourable to extensive manufactories are cheap fuel, cheap labour and cheap capital. For the fuel there may be a partial substitute in good water power—but cheap labour or low wages is a condition not belonging to a new country and very far from being in itself desirable—and cheap capital, which means abundance of money seeking profitable employment amidst a competition which obliges the owners to be content with a low rate of profit, can never be found where the newness of a country causes a want of many improvements for which capital is eagerly sought and highly paid for. No man of sense, considering how readily all the capital existing in this country or which can be drawn into it from abroad† is employed at a high rate of interest, can suppose that manufacturing capital can be obtained on such terms as the competition of the world's-trade would allow as profit. But the scheme perhaps is to manufacture for ourselves and to exclude competition. If this is not now contemplated it is what would soon be claimed were any steps taken to force manufactories. I surely need not employ many words on this subject. Where trade is free every man does what he can do best, and every one buys what he wants where he can get it best and cheapest—protection means a certain class of producers receiving for their goods an extra price above what need be paid, which is taken from the pockets of the consumers,—Why then should the public be taxed to support a class? Not to ensure their having the goods, for these would be freely offered at a lower price. But we pay an extra sum to induce some of our workmen to employ themselves in a way that we fancy rather than in the way that appeared to themselves profitable, at what possible benefit to the community it would be difficult to determine.‡ Manufactures which naturally arise and can be profi-

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† It is sometimes said that this capital instead of being employed in improvements which aid production, repaying themselves and increasing wealth, is borrowed to pay for luxuries which we have no right to enjoy, and is employed as part of our consumption, rendering the whole nation continually poorer. In whatever degree this is the case it is both a dangerous economical, and a bad moral symptom, and it is to be feared that instances could easily be produced, for all countries afford examples in which the possession of a certain, perhaps considerable amount of property, only creates habits of indulgence which require more than is possessed for their gratification, and the existing property yielding an annual produce may, of course, be made answerable for an immediate loan, until the interest swallows up the whole proceeds, and extravagance has ruined the owner. If the condition of our country offers any special inducements to such conduct, if cases of the kind are peculiarly frequent amongst us, and it is the fact that the capital we obtain on the pretence of being able to use it well is wasted in the manner supposed, then we are in a very bad state, and the evil

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being a moral one this is hardly the place for discussing the remedy, but it is surely a hasty judgment which affirms that the large amount of introduced capital is really thus sacrificed ruinously to ourselves and dishonestly in respect to those from whom we borrow, and the great progress of the country of late years in substantial improvements, contributing to wealth, may be taken as proving that there has been a large profitable investment. It would doubtless be wise to spend less on luxuries and reserve more of what we obtain to increase our own capital, and it is well to make the rising generation sensible of the folly of that extravagance which arose from the temporary abundance of money from the expenditure on our great public works, urging them to a frugal and moderate course as really the happiest, and the sure road to prosperity individual and national, but it would be false to assume that our people are not in a condition to partake reasonably in the comforts of life, without dishonest extravagance, or to doubt that capital is largely and well invested in promoting the real advancement of the country.

‡ It is maintained that the history of certain manufactures which could never obtain a firm footing in Canada, whilst our duties were too low to check importation, but which have since greatly flourished as much to the advantage of the public at large as of the manufacturers, the articles being supplied at lower prices than under the former system, proves the advantage of protection in a new country, that we see the same in the successful manufactures of New England and Pennsylvania, and that England herself raised her manufactures by protection and resorted to free trade when she had such extensive possession of the world's markets that she could no longer be injured. To the first point I can only reply that it being quite evident from the nature of trade, that protection is a tax on each consumer for the benefit of the producers, and the producers of

tably conducted without protection are always advantageous, as supplying what is wanted on the spot in the form and style most suited to the locality, and as increasing the variety of human employments, and consequently the chance of every body being employed in the way that best suits him. Where there is every reason to believe a particular manufacture fitted for a country, but preliminary difficulties have prevented its introduction, it may be worth while to offer inducements to engage in it by bounties, but these are always temporary and at best the policy of such fostering of special employments is doubtful. The idea that the introduction of home manufactures would increase the total amount of employment of labour must be delusive, because the whole employment of labour depends on the amount of work to be done, and of capital that can be employed in doing it; but in a young country there is always a superabundance of work to be done, there will therefore always be as much employment as the moveable capital in the country can make profitable, and the general

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any one article must always be few compared with the consumers, protection injures the majority for the advantage of the few, the rule against it thus obtained must be carried out honestly and fearlessly, without stopping to listen to the statements of particular manufacturers, and it is by no means necessary that we should be able to explain every possible case arising, in order to justify the general law. I have no doubt that one who had enjoyed opportunities for observing all the facts, could show in detail that the general law was as true and useful in relation to the specific cases alleged as proof to the contrary, as I plainly see it to be in other cases; but I rely on the certainty of the general law and decline to argue individual cases any further than whether they really fall under the law. We might just as well admit a great moral law and proceed to argue that in certain instances we were at liberty to set it aside for our own convenience. As to the prosperity of manufactures in some parts of the United States, no one doubts that protection will enrich a class, the question is whether it benefits the whole community, and if the inhabitants of the United States generally, and especially of those states which are themselves engaged in other kinds of industry, are content to pay, in the form of increased price, a tax for the benefit of New England or Pennsylvania manufacturers, we have no right or disposition to object to it, though we may have our own opinion of the wisdom thus displayed.

It is a very fashionable mode of reasoning to reproach England, because, beyond all other nations, through the action on her government of the best public opinion, when she has found out a mistake or fault committed, she has endeavoured to repair it. Circumstances favoured with her the use of manufacturing industry. Coal is abundant and available in an extensive district of her country, and the invention of the steam engine showed how it could be properly used as a source of manufacturing power. A crowded population, glad of employment at very moderate wages invited enterprise, and the wealth which had gradually accumuhigh price of labour is a proof that there is abundance of employment.* Neither can home manufactures keep capital in the country; for in a country like ours there is abundant profitable employment both for all the capital belonging to the inhabitants, and also for all that can be introduced from abroad, of which the amount is considerable; none,

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lated in the country, seeking employment at even a moderate return, made the application of extensive capital to industrial undertakings easy, whilst a rapid succession of most important improvements in machinery gave an unheard of impulse to certain branches of industry—from these causes with the trade which her insular position and nautical tastes had gradually formed, England flourished notwithstanding the check arising from the mistaken principle of protection which was probably the less felt on account of the long wars in which she was engaged. Some of her ablest merchants and statesmen had caught glimpses of the truth on this subject, but Adam Smith in his great work incontestibly proved the evils of protection. For a time, as is usual in such cases, he was admired by thoughtful inquirers, but treated as a mere theorist by merchants and politicians. Improved education and improved intercourse overcame this difficulty, and at length strengthened by the opinions of the leading merchants, Mr. Huskisson made the first important step towards the relaxation of protection. The benefit attending every step made and the advancement of the public mind in knowledge of the subject, political economy having now become a recognised science, and engaged the attention both of men of eminent talent, and not a few of them of great practical experience in mercantile and monetary affairs, the progress became irresistible and resulted in the present general free-trade policy of Great Britain. It is easy to say that we became great first and made our change when it could not injure us. The plain fact is that the change was made from a conviction of the truth and consequent practical wisdom of a great principle, and is a lesson to the world at large. Similar reproaches have been made respecting slavery and respecting our Indian empire. England, like other nations, has been guilty of oppression and crime through mistaken policy and prevalent bad feeling at the time, but it is her special glory that she is first in growing wiser and learning better, and that with improved knowledge, her free institutions ensure altered conduct and efforts to repair the mischief done. Her course respecting protection is honourable alike to her intelligence and her principle, and has been rewarded by a success which ought to teach others, and if it has no other effect, at least leaves them without excuse for the follies they commit.

* It is said that the present state of our country affords little or no employment for women or children, and that the number of persons idling about our streets and living by begging or theft, proves the insufficiency of employment. It seems to me, I confess that the more our women can be spared from any other employment than domestic labours and duties, the better for us all. It would indeed be idle to expect that they can all be freed from any other form of labour, but if we allow for their share in rural occupations, for the number required for peculiarly feminine employments, and for those who engage in such trades as printing, watch-making, &c., which depend more on perseverance and ingenuity or tact than

therefore, goes out of the country from any cause which could be counteracted by the existence of another kind of enterprise. The increase of capital of individuals and of the country is the difference between the whole produce of industry and the portion expended in the supply of pressing wants, depending, therefore, on the union of frugality with successful industry. The portion of our produce which we consume is no part of capital. Our reasonable object is to make it give us as much comfort and enjoyment as possible, by buying all we want in the cheapest market, and whether this be found in or out of the country is perfectly unimportant, I fear that the existing tariff

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on mere strength, and the number working in those of our existing manufactories which require their services, with the large demand always existing, and at present badly supplied for domestic assistance, we may perceive that every well brought up, respectably conducted female may, if necessary, creditably support herself, and the more there are who are supported by husbands and parents—not in idleness or silly pretensions to gentility, but in contributing to the happiness of those around them by active industry, the better it is for the community. We must by no means confound that want of employment which proceeds from neglected education, evil dispositions, and vicious habits, with that which arises from the state of the labour market in the country. The poorer classes in every country must begin a life of active labour earlier than is in itself desirable, but unquestionably it is the duty of parents to support their children until they are fit to support themselves. It seems reasonable and even necessary to enforce by compulsion, a certain amount of school education, which is with difficulty reconciled with very early employment, and where children are employed in numbers at an early age, we may observe that their wages are very low, and such as they are, going to the parents, are too often seen to encourage the latter in comparative idleness instead of really improving the condition of the family. No medical man will consider in any more favourable light than as an unavoidable evil, the laborious employment of women and children—especially in close factories; and I must think that an increased demand for such labour would be far from beneficial to our country. Nothing can be more opposed to fact than the notion that the moral condition of our people would be benefitted by such a change. As to the remaining class of unemployed men now living by beggary or theft, there is no doubt that our country is subject to remarkable fluctuations in the amount of employment which at times cause much distress, and which often oblige labourers and artizans to change their residence in order to obtain employment; but the class which lives in idleness and profligacy by improper means, is not to any extent formed by these fluctuations. Its existence indicates deficiency in moral training, early neglect, or bad example on the part of parents; want of compulsory education, which is the only chance of making the blessings of education general, and that predominance of low propensities and absence of moral restraint, which no abundance of well remunerated labour would prevent in bad and corrupt men, but which must be attacked by means not within the range of economical science.

of this country, which is probably too high for the best results to the revenue, has been approved by many, if not even recommended by its authors as being likely to afford indirect protection to home manufactures, which I observe to be a favourite idea with many persons. The nation needs a certain revenue. Customs duties are at present—whether most wisely or not—relied upon to a great extent for supplying it, and every regulation of the tariff is professedly designed for revenue purposes. Now it is very plain that if any such regulation excludes the imported article, and produces a home supply in its place, it has stopped one source of revenue. Whether it has done any good in another way, may be questioned, but undoubtedly it has injured the revenue. I deny that it can have effected any good, because the home manufacture which has arisen, lives by protection, and I hold protection to be always ultimately injurious to all parties and to be robbery committed on the consumers; but if we are to have protection we should have it openly and fairly—not introduced under the plea of revenue, for the sake of which a patriotic people are willing to sacrifice much. An import duty, which stops importation is imposed, not for revenue but for protection, and should only pass when deliberately approved on that ground, which will not be, I apprehend, when legislators understand the true interests and rights of their constituents.

Upon one other subject I desire to offer a few remarks. It must be supposed that adjoining nations, divided only by an artificial line, may, as a consequence of the different views of their governments, have their natural and useful intercourse not a little embarrassed, and be put to exceeding inconvenience in their mutual relations. In the case of this country and its powerful neighbour the United States, an attempt had been made to get over the difficulty by a special treaty termed the Reciprocity Treaty. The view upon which this was arranged was, that between friendly neighbouring States the convenience of both would be served by allowing the unrestricted interchange of various kinds of produce, chiefly articles for immediate consumption, such as might exist without interference with the tariff regulations of either country. Both countries using import duties as a means of revenue, and one also as a protection to home industry, the freedom of intercourse could not be carried to all lengths, but so far as it was arranged it seemed beneficial to both. Particular interests on either side may have thought themselves unfavourably affected; but the public at large seemed to derive benefit. Partly from the commercial jealousy of our neighbours, accustomed on all sides to protection of special interests, still more we may suppose from the peculiar position in which they are placed in consequence of their recent internal struggle, the United States have seen fit to put an end to this treaty. Their government having involved itself in an immense debt and being forced to a very heavy taxation, not only feels compelled to tax for revenue all imports, without letting any escape, but in conformity with its established principle of action, deems it just to the industry of its own citizens to prevent, by high duties, less burdened neighbours from supplying their markets with advantage. The effect must be a great check on the intercourse between the countries, and possibly on our side a diminution of the profit of that which does take place, and it becomes an interesting problem to determine the course which we ought to pursue in our new circumstances. So far as any thing is in our power, without an entire change in our own approved policy and an abandonment of what we deem essential to our best interests, it would, without doubt, be wise in us to study the convenience and give our aid to the plans of our neighbour. Any course dictated by resentment at the loss of certain advantages, or by a desire to annoy or to take advantage of the difficulty of guarding a long frontier, would be altogether unworthy of the character to which we ought to aspire and would not fail to be ultimately injurious to us. Our policy in the case cannot be entirely regulated by economical laws, for there are cases in which such laws may point to one course, while the advantage of the nation on the whole might lead to a different one. The cultivation of friendly feelings with a neighbour is, in itself, not a small thing, and when a great nation has decided on its course, it is wiser to assist than attempt to counteract it. We should at least avoid provoking bad feeling and inviting injuries or enmity by any conduct of ours which is not forced upon us by the necessities of our own affairs.

It might possibly be plausibly argued that now would be the time for us to try the possibility of obtaining revenue by other means than customs duties, to reduce such duties to the lowest amount, or abolish them, and leave it to the ingenuity of our citizens to find means of profitable dealing in spite of prohibitions. Such a change in our present plans would, however, in the circumstances, be highly objectionable. Something is due to respect for moral principles and influences; something to the comity of nations; something to our manifest interest in keeping on the best terms we can with all our neighbours, and to carry out their wishes so far as we are able. It may not be possible for us after recent changes, to carry on much commercial intercourse in a particular direction. To this we must reconcile ourselves and find out, as we certainly may, other places where the products of our country may have even a higher value, and the returns may be quite as advantageous to us. Trade, even with very distant countries, if they happen to be places where what we produce bears a high price, and some things that we want are plentiful and cheap, may be highly profitable, and the circumstances which force a people to look out for new channels for trade, though for the moment injurious, are often eminently beneficial in the result.

When any nation refuses to buy from another, on the protective principle, the spirit of retaliation suggests refusing, in return, to buy any thing from it; but wisdom whispers that we do not the less want what our neighbour can sell on terms which are, on the whole, favourable; and though he may be prevented, perhaps by illiberal views, from purchasing from us what we can offer advantageously, that is no reason for our depriving ourselves of what we can obtain best or cheapest from him. Our business is to raise some desirable things for producing which we have the greatest facilities in the greatest abundance we can, sell what we have raised in the best market we can find, and employ the proceeds in purchasing what we want wherever we can obtain it on the best terms. It is not always that the tailor can secure the shoemaker he wishes to deal with as his customer for clothes, yet he will buy the cheapest and best shoes within his reach, and would be very silly if in retaliation for the shoemaker not buying his clothes he took a dearer or inferior article from another. It would be the height of folly if to spite the shoemaker, he resolved to make such shoes as he could himself, thus wasting time which might have been profitably employed at his own proper business. It is often argued that if we allow a nation to sell to us that does not buy from us, we give up to that nation all the advantage of the trade both ways, and consent to be ourselves losers, whilst, it is said, if we guard by a sufficient duty against this supposed injury, it will become possible for our own people profitably to produce the article in question, and a new branch of industry is introduced amongst us. But it may be replied in the first place that the seller is not the only or of necessity the chief gainer by a transaction. He gains by what he offers, having cost him less labour for its acquisition than would be required for him otherwise to produce what he receives in return, which is quite consistent with the buyer receiving more of what he wants than he could have acquired by using his industry directly in producing it himself, and therefore making a positive gain. The benefit is mutual, and if a neighbour does not choose, from any cause, to come to us as a buyer, but is willing to sell, if we find it profitable to ourselves, and not otherwise, we deal with him in that way. But further, it is replied that the new industry supposed to be introduced by refusing to buy from a neighbouring nation, is sustained only by the protection afforded by the duty we have imposed, that is by a tax for its support laid on the consumers, who are thus compelled to pay for the article more than they might have obtained it for; again, it should be observed that those who engage in the new occupation are to a great extent withdrawn from other pursuits in which they were previously engaged. Should it even appear that many of the workers at the new branch of industry were drawn into the country for the purpose, and added to its population, this, though in new countries with plenty of room for all, an undoubted benefit if the new comers are really self-sustaining, would be no benefit if their employment is only kept in activity by a tax on the community, Besides, whence comes the capital required for conducting the new undertaking? If from home capitalists, it was already all wanted for employments naturally arising in the country, and has been drawn aside from these by a prospect of heavy returns extorted by the protection and unjustly taken from the consumer; but if it comes from abroad, the temptation being a forced and unjust gain it can confer no real benefit on the country which receives it, for as the interest on foreign capital goes immediately out of the country, its advantage entirely depends on the additional profit its employment affords, and the assistance it gives by its use to industry; but in this case what is gained is by loss to the consumers, that is, to the people at large of the country in which the capital is invested. I conclude that however desirable reciprocity of advantages between neighbouring nations may be, the refusal on one side to buy from us does not prevent its being our interest and true wisdom to receive whatever is offered to us on favourable terms, and that we make the best of our condition when, although our neighbours judge it necessary to shut out what we have to offer for sale, we gladly purchase from them whatever we can get best from them, never doubting but that our people can find enough to do profitably, and determined not to attempt controlling according to our fancies the natural course of trade, or to force amongst ourselves any kind of production, on any pretence, which cannot sustain itself against fair competition.

The part of the question which has now been discussed does not appear to me to involve any serious difficulty, though there are strong popular prejudices against the view I have taken, and many who think themselves favourable to freedom of trade justify exclusion against those who will not admit our produce, but it is when we come to consider the general adaptation of our own tariff to our present relations with our neighbours that some difficulty arises, not so much I think from any obscurity hanging over the economical questions as from other circumstances, which must be taken into account. If I could see any course possible to be chosen by us which would assist our neighbours in carrying out the policy they have chosen, and, at the same time, lessen amongst ourselves the temptation to the demoralizing and pernicious practice of smuggling, I should earnestly recommend it, as on the whole to be preferred, even if scarcely defensible on grounds of economical science. I fail to perceive, however, how we could support the policy of our neighbours unless by adopting nearly similar duties on imported articles, a thing totally and obviously impossible, because those duties amount in many cases nearly to prohibition, and we, requiring revenue from our tariff to the greatest attainable extent, and having no desire to force unprofitable production by the protection such duties would afford; being also bound by our strongest and dearest interests to the British empire, and therefore incapable of intentionally preventing trade with it, have no choice but to arrange our duties so as without sensibly checking consumption, to yield the necessary income. We ought perhaps to lay a moderate duty on some articles recently received free from the States, certainly we cannot consistently with our obvious interests depart in other respects from the system we have adopted, though we may possibly make that system more perfect. If two adjoining nations entertain widely different ideas of what is right, just, and wise, the perseverance of each in its own plan will in time show which is really most advantageous, thus giving a lesson to the world. The United States has chosen the policy of protection which its opponents believe to be authorised robbery of the many for the benefit of a few. Our's, I trust, will continue to be the policy of unrestricted freedom of trade. Let duties be imposed for revenue only on as many different articles as are worth their collection, but cautiously kept within such bounds as not to limit consumption, and they will reach their highest productiveness with least inconvenience or injury. From this course, neither any action of their neighbours, nor any desire of special protection of particular interests, arising among their own citizens, will turn an enlightened people, who will steadily discountenance every application for that protection of special interests which always means a desire to live at the public expense, and make personal or class advantages prevail over the general good.

ON THE VOCAL LANGUAGE OF LAURA BRIDGEMAN.

BY DANIEL WILSON, LL.D.

The study of the Science of Language in special reference to the discussions of Ethnologists and Anthropologists on the origin and progress of the human race, is giving novel importance to the rudest utterances of savage tribes; and even to the seemingly inarticulate sounds and "gesture language" of the deaf mute. The origin of Language itself, is anew discussed from very diverse points of view; and conflicting theories are sustained by evidence from many unexpected sources. Regarding language as a system of organic sounds subservient to intelligent volition, and employed as the symbols of ideas, the inquiry into the source of its primitive roots, is guided mainly in one or other of the two directions, either (1) of the miraculous endowment of man with the requisite radicals as constituent elements of language—"*phonetic types*," according to Professor Max Müller, "produced by a power inherent in nature: an instinct of the mind as irresistible as any other instinct;"—or (2) of the development of language by man himself as a being already endowed with reason. From among the many diverse sources of information relative to the operations of the human mind in associating specific sounds with ideas, one may be selected for present consideration, which has already attracted a large amount of attention in various points of view, and is still calculated to furnish aid in prosecuting the inquiries here referred to.

A great and well-founded interest has been awakened by the successful efforts of Dr. Howe of Boston, to communicate language, and the power of interchanging thought with others, to Laura Bridgeman, a blind, deaf mute. The failure of the same skilful teacher in the case of Oliver Caswell, another mute similarly destitute of the senses of sight and hearing, adds to the interest of the former case, in which the peculiar intelligence of the object of this experiment, and the response of her own long dormant, yet vigorous reasoning powers, constituted the most important elements in effecting the success achieved.

Laura Bridgeman is not only deprived of sight and hearing, but she has no sense of smell, and is nearly destitute of taste ; and thus, with one exception, her limited sense of touch is the sole means she possesses of communing with the outer world. She was in her seventh year when, in 1837, she entered the Boston Institution for the Blind. Dr. Howe, in his first observations regarding her, noticed that "there were marks of fineness in her organization; and that the nervous temperament predominated. This," he remarked, "gave sensibility, activity, and, of course, capacity;" and so encouraged him in the hope of that intelligent response on the part of his pupil, without which, all the efforts of the teacher must prove vain.

Describing Laura's arrival at her future home, and the first steps employed for the purpose of establishing some means of intelligent intercourse with her: Dr. Howe remarks, "She seemed quite bewildered at first, but soon grew contented, and began to explore her new dwelling. Her little hands were continually stretched out, and her tiny fingers in constant motion, like the feelers of an insect. She was left for several days to form acquaintance with the little blind girls, and to become familliar with her new home. Then the attempt was made systematically, to give her a knowledge of language, by which, and by which only, she could ever attain to any considerable development of intellect, or of affection." But the difficulty was, how to begin. Laura could not, like her blind companions, hear the spoken word, or name, of the objects within reach of her only available sense: that of touch ; nor could she, like the deaf mute, see the visible phonetic or pictorial sign, or the written word. Yet until some recognized analogy between symbols, letters, or other arbitrary signs, and the things so expressed, could be established, all efforts at interchange of thought between herself and others, were limited to the few simple signs by which she had learned to communicate her sense of hunger and thirst, and her pleasure or distaste in reference to any action affecting herself. The very simple process adopted by her intelligent teacher has been thus recorded by himself. "The first experiments were made by pasting upon several common articles, such as keys, spoons, knives, and the like, little paper labels, on which the name of the article had been printed in raised letters. The child sat down with her teachers, and was easily led to feel these labels, and examine them curiously. So keen was the sense of touch in her tiny fingers, that she immediately perceived that the crooked lines in the word *key*, differed as much in form from the crooked lines in the word *spoon* as one article differed from the other. Next similar labels, on detached pieces of paper, were put into her hands, and she now observed that the raised lines on these labels resembled those pasted on the articles. She showed her perception of this resemblance by placing the label with the word *key* upon the key, and the label *spoon* upon the spoon." A familiar token of approval encouraged Laura to persevere in this exercise, until she had, in a similar way associated the printed names of many familiar objects with the things, so that when a number of printed labels were thrown together in a heap, she would select from them the proper one to represent any object produced.

Here, as will be seen, the teaching of words preceded that of letters. The next step was to cut up the labels into their component signs; and to teach her to arrange the *k, e, y,* together to form *key*, as the sign of that object; and the *k, n, i, f, e,* as the combined symbol of *knife*. The process was necessarily slow. The teacher had to enlist the sympathies of the child, in what was as yet the mere solution of a set of arbitrary puzzles. It was indispensable, therefore, to avoid fatiguing her, and so creating a distaste for the employment; and thus week after week elapsed, with no very encouraging progress. Though, perhaps, the same might be said in most first efforts at communicating the knowledge of letters and printed words to the ordinary pupils of an infant school. But this was the crucial stage of success or failure. Beyond this, in other cases it has been found impossible to advance; and only the responsive intelligence of the pupil could avert failure.

"Hitherto," says Dr. Howe, "there had been nothing very encouraging; not much more success than in teaching a very intelligent dog a variety of tricks. But we were approaching the moment when the thought would flash upon her that all these were efforts to establish a means of communication between her thoughts and ours. It was as though she were under water and we on the surface over her, unable to see her, but dropping a line and moving it about here and there, hoping it might touch her hand, so that she would grasp it instinctively. At last it did touch her hand, and she did grasp it; and we pulled her up to the light; or rather she pulled herself up. This exercise with the separate letters could not go on long without her perceiving that it presented a way by which she could make a sign of what was in her own mind, and show it to another mind. At last she did perceive it. She grasped the end of the cord that was thrown to her, and was drawn by it up and into human association. From this moment the way was plain and easy, and the success certain." Under the guidance of her skilful teacher she not only acquired the power of verbal thought, and the means of conversing with others, but has manifested unusual mental vigour and aptitude for intellectual development. When, however, she is spoken of as mute, it has to be borne in remembrance that there is no defect in her vocal organs. Like the majority of deaf-mutes, she does not speak, simply because she is alike destitute of all knowledge of the nature of audible sound, of the effect it can have upon others, and of its utterance by them. The mere deaf-mute sees the motions of the lips and other external indications of speech, of which she is unconscious; so that her mind is debarred from all conception of spoken language, except such as may be innate and instinctive.

Here then is a remarkable example of an active and highly intelligent mind, in a condition more completely excluded from acquiring phonetic signs of thought than any "wild man" shut out from all intercourse with his kind, and growing up from infancy as one of the natives of the forest. It may possibly throw some light on the general question of the source of language if we inquire how far, in her case, any traces of instinctive elements, or phonetic types, could be discerned. The first point to be noted in Laura Bridgeman is that, so far from being mute by nature, she was accustomed, before being subjected to training, to indulge freely in the use of her voice; but this being unregulated by the ear, and associated with no specific ideas to the hearers, led only to harsh, and seemingly aimless sounds. Her teachers accordingly, while imparting to her a finger-utterance, arrested her in the effort to form a phonetic language, and taught her to restrain her desire for vocal expression. Yet even now the sense of enjoyment survives; and she will at times, when alone, indulge herself in giving free utterance to her voice.

But while the process of developing a vocal language was arrested in Laura Bridgeman by the very means which brought her into intelligent intercourse with her fellow-beings, there is one important exception. Abstract ideas are now represented solely by her acquired finger-language, or by writing; but the persons she comes in contact with receive from her an audible designation. She has a sound, generally a monosyllable, for every individual in whom she takes an interest. Dr. Lieber, who, some years since, devoted considerable time to the study of her vocal sounds, ascertained that she then used nearly sixty as signs of individuals.[1] It is thus apparent that while she lacks all means of vocal intercourse, by which alone organic utterances are matured into the recognized symbols of thought, she nevertheless has the innate idea of language, and makes sound supply the representatives of impersonations. The names moreover, are not arbitrarily given; but appear to have some association of specific ideas with certain sounds. Miss Wright, one of her teachers, remarks: "Before learning language, Laura used many signs to make known her wants, and for a long time gave to many of her friends names, which in some way were associated in her mind with the variety of their characters. She produces still the same sound for me that she made eight years ago, with this difference, that originally it was very soft and gentle; now it is louder and fuller, to correspond, as she says, with the change in myself." In another case she deliberately altered the associated sound. "One of her teachers," says Dr. Lieber, "told me that Laura once omitted to produce the accustomed sound indicating the person who related the incident, for a whole week; after which she uttered an entirely different name-sound, and said: this is your name;—which name, the teacher retained at the time the account was given to me." Here we perceive a deliberate selection and change of sounds to express certain associated ideas, and probably altered opinions.

Familiarity with the use of the finger-alphabet, and intercourse by its means with others, has led Laura to drop many of the sound-names of individuals; and now she frequently converses at great length with herself, speaking, even in dreams, with one hand, and replying with the other. But the progressive developement of a spoken language can be seen in this, that the sound originally employed as the name of one of her teachers appears to be employed now as an equivalent to the words *teacher,* and *to teach.* Dr. Lieber draws attention to the fact that all the personal designations of Laura were monosyllables. In the brief personal intercourse, however, I had with her, during a visit to Boston in 1864, she repeatedly used the dissyllable *do-tah,* by which she now designates Dr. Howe. But her sounds, or names, are chiefly monosyllabic, or consist of a repetition of the same syllable. They differ, however, greatly from the accustomed sounds of the English language, The lips and throat are used much more than the tongue; and consonantal sounds,—as *b, d, f, fo, pa, pik,, pr, ss, t, ta, ts,*—are most frequent. Among separate vowal sounds, *ee* and *oo* are most noticeable. Rut Laura has no ear to guide the modulations of her voice. They are not perceived by her as sounds, and have not, therefore, been matured into articulate speech; but are in many cases mere gurglings, chucklings, or moanings, as difficult to reduce to writing as the unfamiliar languages of the Clalam Indians or the Hottentots. Our words are formed with a special view to their effect on the ear, with the rolling *r,* the sibillant *s,* the broad *aw,* the prolonged *ll,* etc., and experience teaches their effect on others. But Laura's selection is probably guided by the very diverse perception of the only sense she is conscious of; so that sounds ineffective to the ear may be very expressive in the effects produced on her own organs of speech.

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[1] *Smithsonian Contributions*, vol ii.

But apart from the training of the ear, both to regulate the modulations of the voice, and to instruct it by imitation, Laura's great want was the interchange of ideas, prior to receiving from others a ready-made language, which superseded the developement of vocal utterances as her representatives of abstract ideas. She gives sudden expression to the sound *Ff,* or *Fi,* when displeased at being touched by strangers; and in like manner she is observed to utter one or two other familiar involuntary interjections, or emotional expressions of pleasure or pain. But it is more important to notice that she uses the interjectional *fie,* not only as a sign of irritation and dislike, but also when playfully repelling advances; thereby indicating the change from an involuntary utterance, to its adoption as the sign of an idea.

In Laura Bridgeman then, we recognize a being possessed of lively intelligence, delicate mental perceptions, and acute moral and sympathetic feelings; capable of all organic utterances, but excluded by absolutely impassible barriers from any perception of spoken language. She cannot even conceive of sound as a thing heard; yet she aims at expressing ideas by its means, and derives pleasure from her own vocal utterances. If language be primarily a divine gift, or instinctive faculty, in which the organs of speech respond to conceptions of the mind, as other organs act in obedience to mental volition, her's seems to be a case where some of the assumed phonetic types or roots of language ought to be traceable. The interjectional element of language is clearly recognisable; while that of onomatopœia is precluded. Laura Bridgeman, as we see, possesses not only the rational soul, but mental faculties of a high order. But shut out from the external world, from whence knowledge is transmitted to us through eye and ear; and devoid of all means of communicating with other minds, her whole mental faculties lay inert, like one in a state of syncope. She uttered sounds, unquestionably associated in her mind with ideas; and craved in all ways to open up some avenue of intercourse with other minds. But all was darkness, silence, isolation, till she attained to an interchange of thought and experience with her fellow-beings. Nevertheless the mind was there; the means of manifesting its activities was alone wanting; and that supplied, the force of William Humboldt's remark forthwith appears:—"There could be no invention of language unless its type already existed in the human understanding. Man is man only by means of speech, but in order to invent speech, he must be already man."

The modern idea of man's origin by developement from an inferior unintelligent order of animated beings, presupposes an animal devoid of speech; and as intellect dawns, on its first stage of developement into the reflecting being, its originally limited powers of utterance gradually extend their compass, and language would thus be the slow product of effort, practice, and culture. On such a theory the detached elements of a vocabulary would be the first product; and the scientific relations of grammatical forms of language would pertain only to its latest stages, and in their most perfected condition to written languages. But, on the contrary, grammatical forms are now recognised as among the early and most enduring characteristics of a language; resisting changes which revolutionize its vocabulary. The inference is therefore justified, that an intelligent mind, capable of comprehending and using the forms and laws of structure involved in the relations of language to the innate perceptions of individuality, time, place, and all other discriminating niceties of what we call grammar, was an endowment of primeval man: fitting him for developing the associative relations of sound into a vocabulary expanding with his growing knowledge and intellectual requirements.

But, in addition to the attempts at the formation of a vocal language which have been noticed in the case of the remarkable blind and deaf-mute, Laura Bridgeman, some valuable indications of the instinct of language may be derived even from her mute signs. She exhibits all the impulsive manifestations of feeling: smiling, laughing, blushing, shuddering, and weeping. She gives the imperative stamp of the foot, the affirmative nod, the negative shake of the head, and other familiar signs of mental action, which she has not acquired, and cannot conceive of as perceptible to others. "When Laura is astonished or amazed," Dr. Lieber remarks, "she rounds and protrudes her lips, opens them, breathes strongly, spreads her arms, aad turns her hands with extended fingers upwards, just as wo do when wondering at something very uncommon. I have seen her biting her lips with an upward contraction of the facial muscles when roguishly listening, at the account of some ludicrous mishap, precisely as lively persons among us would do. * * * When Laura once spoke to me of her own crying, when a little child, she accompanied her words with a long face, drawing her fingers down her face, indicating the copious flow of tears; and when, on New Year's Day of 1844, she wished in her mind a happy new year to her benefactor, Dr. Howe, then in Europe, she involuntarily turned towards the east, and made with both her outstretched arms a waving and blessing motion, as natural to her as it was to those who first accompanied a benediction with this symphenomenon of the idea, that God's love and protection might descend in the fullness of a stream upon the beloved fellow-being." In its touching pathos, this expressive benediction of the blind and deaf-mute surpasses that last farewell of "the blameless king," and Guinevere, when

> "She felt the king's breath wander o'er her neck,
> And, in the darkness, o'er her fallen head,
> Perceived the waving of his hands that blest." *

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* Idylls of the King.

The use by Laura of the affirmative nod, and the negative shake of the head, has already been referred to. Even when indicating the *yes* or *no* by means of her fingers, she involuntarily accompanies them with those signs. She also uses the negative shake of the hand by which, as it were, we repel an idea, and the abrupt movement of the head by which aversion is expressed. "The Italians," says Dr. Lieber, "move repeatedly the lifted digit from right to left, as a sign of negation, while the modern Greeks throw back the head, producing at the same time a chuckling noise with the tongue. Laura makes these signs even without writing Yes or No in the hand of the person with whom she converses: having learned, but not having been told, that some how or other we perceive this sign, or that it produces upon us the desired effect; although she is unable to solve the great riddle of the process by which this is done. Laura, far below our domestic animals, so far as the senses are concerned, but infinitely above them because she is endowed with a human mind, had attained to the abstractions of affirmation and negation at a very early age; while no dog or elephant, however sagacious, has been known to rise to these simple ideas, for which every moment even of animal existence calls, wherever reflection sways over the naked fact." Laura then,—while still with knowledge, not as in Milton's case, at one entrance, but at all entrances quite shut out, and without any possibility of conceiving of sound as audible or in any other way perceptible by others,—felt nevertheless an instinctive impulse to express her emotions and ideas, both by sign and sound. Speech was struggling in her for the responsive union on which the birth of language depends. Her interjectional utterances were wholly independent of imitation; onomatopœic vocal-signs, if conceivable at all in her case, can only occur as suggestions of the one sense of touch by means of which she perceives the most delicate vibrations, and recognizes a friend or stranger by his step. No phonetic types of language can be discerned in her utterances; but the growing association of ideas with specific sounds, shows how thoroughly the rudiments of language as a means of expressing, though not of interchanging thought, appeared with the first response of recognition. Strange indeed, is it to think how that imprisoned soul in its lonely solitude, may have been giving audible expression to ideas, as full of meaning as the prattling of an intelligent child; and craving in vain the sympathetic return, to which it at length responded with such grateful ardour. Even now, when alone, she may be heard to utter the name-sound of one of her friends; and, on inquiry as to the reason of it, refers to some thought she was then indulging in about the absent one. While I was attempting to speak to her, she manifested a sense of irritation and perplexity, consequent on my blundering use of an unfamiliar finger-language. In the midst of this, Dr. Howe entered the room, and she immediately brightened up, and with a lively smile uttered the sound for her benefactor. To me it would have been meaningless but for the obvious association of ideas; but to her friends it was the intelligible utterance of a name, accompanied with an expressive welcome.

Each subsequent stage of Laura Bridgeman's progress has been watched and recorded with intelligent interest. After mastering the use of the raised alphabet of the blind, she next acquired the manual alphabet of the deaf-mute; and so could soon spell, on her fingers, the names of everything within her reach. Her next step was to master the names of their qualities; as, *hard*, *soft*, *long*, *broad;* though it proved a slow and difficult process to carry her mind beyond the special associated idea, as the hardness of the table, the softness of putty, &c., to that of hardness, softness, or the like qualities in the abstract. But, her age must be borne in remembrance, along with the far briefer period of her emergence into intellectual life. The appreciation of abstract ideas is not only of slow growth among children, but is found very partially developed among savages.

The next step was to acquire the expression of relation. Thus, a ring was placed on a box; and, after she had been made fully aware of this, she was made to spell *ring on box*. It was then placed on a hat; and, in response to the sign to renew her spelling, she repeated *ring on box.* But, on being checked, and the right word given, she speedily caught the idea; and, following this and other objects through successive changes of place: in a bag, on a desk, in a drawer, &c., she thus not only learned to name the thing with which the object was thus locatively associated, but caught such nice distinctions as that between *on* and *in.* Active verbs, such as to *walk,* to *run*, to *eat*, to *drink*, to *sew,* &c., were easily acquired; though the use of the auxilliary verbs, and the distinctions of mood and tense, were of slow attainment.

Next followed the teaching her to write. "It was amusing," says Dr. Howe, "to witness the mute amazement with which she submitted to the process, the docility with which she imitated every motion, and the perseverance with which she moved her pencil over and over again in the same track, until she could form the letter. But, when at last, the idea dawned upon her that, by this mysterious process, she could make other people understand what she thought, her joy was boundless."

In relation to numbers, Laura Bridgeman is familiar with the process of addition and subtraction, and has a pretty accurate idea of the measurement of time. But, with her, a *hundred* is used as an indefinitely great number. She has the same accurate judgement of distances, and of relations of place, as is usually manifested by the blind. She walks with unhesitating confidence through the rooms and corridors of the large institution at South Boston, devoted to the use of the blind; and will rise from her seat, go straight toward the door, put out her hand at the right time, and grasp the handle, seemingly with as accurate precision as if she saw it.

Laura Bridgeman is now thirty-seven years of age. She continues to reside in the Perkins Institution for the Blind, in South Boston, where she is surrounded by those familiar to her, and with whom she can hold ready intercourse. Her mind has expanded with her years, and revealed an intellect of great quickness, a keenly sensitive temperament, and a strong desire for knowledge. The religious training of her later years has accustomed her to the consideration of many profound speculations and inquiries; and her thirst for knowledge has been gratified in all ways within reach of her skilful and sympathising teachers. She has thus been placed in kindly companionship and intelligent intercourse with her fellow beings. But yet, with wisdom at so many entrances quite shut out; with four of the five gateways of knowledge for ever closed: the imprisoned soul escaping with difficulty through the solitary and straitened portal of its prison-house, presents, in every glimpse we obtain of its intercourse with the outer world, and every revelation of its own inner life, subjects of profoundly interesting and suggestive study. Among these, not the least interesting, on many accounts, are the vocal sounds in use as names of objects and symbols of ideas, by one to whom the very idea of sound is inconceivable; and in whose mind it seems hardly possible to imagine that any intelligible conception can have been formed of an auditory sense, or of the impressions produced on others by such vocal utterances as she, nevertheless, has been wont from childhood freely to indulge in, with a sense of enjoyment which still survives.

CANADIAN INSTITUTE.

Annual Report of the Council for the year 1864–1865, *from* 1st *December,* 1864, *to* 30*th November,* 1865, *inclusive.*

The Council of the Canadian Institute have the honor to present the following report of the proceedings of the Society for the past year:

I. MEMBERSHIP.

The present state of the membership is as follows:

Members at commencement of Session, December, 1864		400
New members elected during the Session 1864, 1865		8
Total,		408
Deduct—Deaths	1	
Withdrawn	11	—12
Left the Province		
Non-payment		
Total 30th November, 1865		396
Composed of Honorary Members		4
Life Members		31
Corresponding Members		6
Junior Members		3
Ordinary Members, 352		352
Total		396

II. COMMUNICATIONS.

The following list of Papers, read at the Ordinary Meetings held during the Session, will be found to contain valuable communications, including some of general interest.

10th December, 1864.

Rev. Prof. Hincks, F.L.S , &c., "On the King Vulture and other Birds of Tropical America."

Rev. H. Scadding, D.D., "On Errata Recepta, Written and Spoken."

21st December, 1864.

Hon. Vice-Chancellor Mowat—The President. "The Annual Address."

28th January, 1865.

Rev. Prof. Hincks, F.L.S., &c , "Remarks on the Principles of Classification in the Animal Kingdom.

Prof. E. J. Chapman, Ph. D., Read a Letter from Mr. Herrick, and made some remarks on some specimens of minerals from the North shore of Lake Superior exhibited by him.

4TH FEBRUARY, 1865.

Prof. D. Wilson, LL.D., "On Some Observations on the Vocal Utterance of Laura Bridgeman, the Blind and Deaf Mute, in their Bearing on Questions in Relation to the Origin of Language made during a recent visit to Boston."

11TH FEBRUARY, 1865.

M. Barrett, Esq., M.D., "On Bone, its History and Development."

18TH FEBRUARY, 1865.

Prof. D. Wilson, LL.D., "On certain Characteristic Types of Canadian Heads. Illustrated by the Conformateur."

Rev. H. Scadding, D.D., "On Anglicised German."

4TH MARCH, 1865.

Rev. Prof. Hincks, F.L.S., &c., "Thoughts on Belief and Evidence."

11TH MARCH, 1865.

Oronhyatekha (a Mohawk Indian), "On the Forms and Grammatical Structure of the Mohawk Language."

18TH MARCH, 1865.

M. Barrett, Esq., M.D., "On Bone, its History and Development."

1ST APRIL, 1865.

Prof. Wilson, LL.D., "On the Changes of Levels of Land, especially of that part of Scotland between the Forth and Clyde."

21ST APRIL, 1865.

Prof. D. Wilson, LL.D. "Exhibited a collection of Specimens of Flint, Bone and Horn implements and Cave Brecia found in the Dordogne Caves in Central France, by Mr. Chester, and transmitted by him to Dr. Thorburn, through whose kindness he was permitted to produce them."

Mr. McTavish of the Hon. Hudson Bay Company, "An account of the Esquimaux and his experience in the North of the Hudson Bay Territory."

III. REPORT OF EDITING COMMITTEE.

The Editing Committee, referring to last year's report, which suggested to the Council "a consideration of the propriety of closing the present series of the Journal and of placing the publication on a different footing, have to state that the Council having resolved to carry on the present series at least to the close of the tenth volume, and then to take into consideration the most desirable course for the future, the time has come when some decision must be arrived at, and the whole subject must engage the attention of the Council. Your committee have used their best endeavours to make the present volume worthy of its predecessors, and they hope that their object has been accomplished. The volume, of which the last number, from causes uncontrollable by the editor, has not yet appeared but is in a state of forwardness, will be found to contain fifteen original articles besides reviews and translations, making up the usual amount of matter, and they trust containing not less than usual of that which is of permanent value. Whatever course the Council may resolve upon, influenced by pecuniary considerations or by the hope of exciting some fresh interest, your committee feel satisfied that the ten volumes now completed are a credit to the Canadian Institute, and an honourable monument of its labours in the promotion of Literature and Science.

The expenditure on the *Journal* for the year cannot be reported until the accounts for the number now in hand are made up, but there will be a further reduction in its amount as compared with last year, in censequence of a reduced number of copies.

All of which is respectfully submitted.

WILLIAM HINCKS, *General Editor.*

CURATOR'S REPORT.

The Curator of the Institute begs to report that the museum has been safely removed from the old premises to the large and commodious room set apart for it in the present building. This room has been specially fitted up for the purpose with glass cases, stands, and other conveniences requisite for displaying to advantage the several objects of interest. Through the kindness and labour of Dr. Scadding, the antique and other coins belonging to the institute have been named and placed in a separate case, in regular order. Accompanying the coins, and illustrative of them, is a catalogue specially prepared by Dr. Scadding, and extremely useful as a book of reference. The museum being placed on a new footing, with ample accommodation, it is to be hoped that the members of the institute will take a lively interest in its advancement, and contribute, or get others to contribute, such object or objects as will add to its attractiveness and value.

W. BARCLAY McMURRICH, *Curator.*

REPORT OF LIBRARIAN.

The librarian reports that the books of the institute have been safely transferred to the new rooms on Richmond Street, and placed on the shelves there provided for them ; and that, as soon as an arrangement of them is made, which shall be found to be practically convenient, a new catalogue will be prepared.

REPORT OF MEDICAL SECTION, FROM NOVEMBER, 1864, TO NOVEMBER, 1865.

The meetings have been held every alternate Friday during the session.

Since the last report, papers have been read and communications made on many interesting subjects, regarding which discussions have also taken place.

The following is a list of the papers and communications :—

Polydipsia, by Dr. Thorburn.
Lithotomy, by Dr. Lizars.
Metal Magnesium, by Dr. Barrett.
Retained Placenta, by Dr. U. Ogden.
Physiological developement of bone from Periosteum, by Dr. Barrett.
Zymotic disease and its treatment by the Sulphites, by Dr. O'Dea.
Prehistoric Remains, by Prof. Wilson.
Customs and habits of the Esquimaux, George Simpson McTavish.

Sciatica, by Dr. U. Ogden.

Cancer and polypus Uteri, by Dr. O'Dea.

Treatment of Cholera Canadensis by the hypodermic Injection of Morphia, by Dr. Ross.

Treatment of Typhus Fever by the Permanganate of Potash, Dr. C. B. Hall.

Pelvic Hematecle, by Dr. Lizars.

In June, Dr. Jas. Jos. O'Dea, our former secretary, having intimated his determination of leaving this city, a resolution was proposed, and carried unanimously, thanking him for his past services, and hoping that his future career would be successful.

At the May meeting, the election of the following officers was made :—

Chairman,	Dr. Barrett.
Secretary,	Dr. Thorburn.
Committee of Management,	Drs. C. B. Hall and W. Ogden.

Subsequently, Dr. Barrett delivered an interesting address on the past and future of the section.

TREASURER.

The Treasurer, in account with the Canadian Institute, for the year 1864-65; from 1st December, 1864, to 30th November, 1865.

Debtor.

Cash balance, last year	$ 585	22
" interest received { on securities	186	00
" interest received { from other sources	2	22
" received from members	483	70
" " John Dickson, Esq	80	00
" " for Rent	152	87
" " A. E. Walker, Esq., bdg. fund	1	00
" " Parliamentary Grant	750	00
" " for sale of waste paper	6	20
Securities held	3100	00
	$5347	21

Creditor.

Cash paid on account of Journal { for 1864, $473 08 } { for 1865, $384 32 }	$ 857	40
" " Library and Museum	134	84
" " Sundries	958	63
Securities held	3100	00
Cash paid Bank Commission	2	12
Balance in Bank	294	22
	$5347	21

SAM. SPREULL,

Toronto, December 12th., 1865. *Treasurer.*

Vouchers compared with cash book and found correct. Balance due by Treasurer, Two Hundred and Ninety-four dollars and Twenty-two cents: $294 22.

G. H. WILSON,
W. J. MACDONELL. } *Auditors.*

Statement of the Canadian Institute General Account, for the year 1864-65; from 1st December, 1864, to the 30th November, 1865.

Debtor.

Cash balance, last year		$ 585 22
" interest received	on securities	186 00
	from other sources	2 22
" received from members.		483 70
" " for Rent of House		152 87
" " from John Dickson, Esq		80 00
" " from A. Walker, Esq., building fund		1 00
" " for waste paper		6 20
Due by members, 1856 to 1865, inclusive		1802 25
Due for sale of Journal	old, $114 25 new, $49 25	163 50
Cash, Parliamentary Grant		750 00
		$4212 96

Creditor.

Cash paid on account of Journal	for 1864, $473 48 for 1865, $384 32	$ 857 40
" " Library and Museum		134 84
" " Sundries, Institute		958 63
Due on account of Journal, 1865		412 00
Due on account of Sundries		85 00
Paid on account of Bank Commission		2 12
	Estimated Balance	1762 97
		$4212 96

Statement of the Building Fund.

Debtor.

Balance from last year	$6314 05
Cash, Interest on Securities	186 00
" Donation, A. E. Walker, Barrie	1 00
" Rent received for House	146 63
" " the Store-house	40 00
Subscriptions (not collected)	2139 00
	$8826 68

Creditor.

Cash Commission to Mr. Wightman	$ 9 37
" Taxes on Store-house	11 25
" Ladder for House, and Cartage	2 34
" Cleaning Water-closet	6 00
" Snow-cleaning, 50cts. Lock, 80cts	1 30
" Repairs	3 50
" Insurance, 18th Sept., 1865, to 18th Sept., 1866, for $1,800	36 00
Balance	8756 92
	$8826 68

SAM. SPREULL, *Treasurer.*

THE ENTOMOLOGICAL SOCIETY OF CANADA.

REPORT FOR 1865.

The Council of the Entomological Society of Canada, in presenting their THIRD Annual Report, beg to congratulate the members on the continued success of the Society and its Branches. The list of members, though considerably varied by removals from the country and resignations, has still increased a little, there being now *fifty-two* names on the books, of whom *twenty-seven* belong to the Parent Society. The QUEBEC BRANCH now numbers *thirteen* members; " it has, however, to regret the loss of some valuable members, caused by the removal of the Government Offices to Ottawa,—members who felt great interest in the Society, and took an active part in carrying it on. Four papers were read during the year, three of which were published in the 'Canadian Naturalist and Geologist.' A number of valuable papers on Entomological subjects have been added to the Library during the year. The cabinet now contains a respectable number of specimens of all orders, including a good collection of named Diptera. The monthly meetings have been well attended, and several very pleasant excursions were made in the summer, resulting in the capture of many rare insects, some of them new to the insect Fauna of Lower Canada."

The LONDON BRANCH has now *twelve* members; regular monthly meetings have been held, at which valuable papers were read, and useful discussions carried on; during the summer season, also, very successful field meetings were held on the mornings of every Monday, when the weather permitted.

Two general meetings of the PARENT SOCIETY have been held during the year, and one or two field meetings; throughout the Autumn and Winter very pleasant and useful meetings have been also held once a month at the houses of members residing in or near Toronto. A second list of Canadian Lepidoptera, including upwards of 350 species, has been published, and distributed among the members. Supplies of German Entomological pins, and sheet cork have been imported for sale to members at cost prices. The Society's Cabinet has received some large and valuable additions of European insects of various orders, through the liberality of Francis Walker, Esq, F. L. S., of the British Museum, London, England; several rare specimens for Canada and the United States, have also been presented to it. On the whole, the Council cannot but consider the prospects of the Society very cheering, nothwithstanding some disadvantages under which it at present labors, chiefly arising from the smallness of its funds. They regard too, with much satisfaction the progress which has been made in the scientific and practical study off Canadian insects; and are much gratified at the kindly recognition which has been paid the Society, both in the United States, in England, and on the Continent of Europe.

All of which is respectfully submitted,

CHARLES J. S. BETHUNE, *Secretary.*

The Council have also to report that in the month of September last, the Institute removed from the rooms in York Chambers to the premises owned by it in Richmond street, which have been fitted up for library, museum, lecture room, and reading room. They trust that the change while only temporary, may tend to promote the comfort of the members and increased attendance at its meetings.

APPENDIX.

DONATION OF BOOKS, &c., SINCE LAST ANNUAL REPORT.

FROM THE GEOGRAPHICAL SOCIETY, PER H. ROWSELL, ESQ.

Proceedings of—Vol. 8, No. 1, 31st December, 1863	1
2, 25th February, 1864	1
3, 28th April "	1
4, 29th June, "	1
5, 23rd May, "	1
6, 1st October, "	1
Journal for year 1862, Vol. 32	1

FROM THE GEOLOGICAL SOCIETY, LONDON, PER H. ROWSELL, ESQ.

February 1st, 1864.—Vol. XX., Part 1; No. 77	1
May 1st, " " " 2; No. 78	1

FROM THE GEOLOGICAL SOCIETY, LONDON.

August 1st, 1864, Vol. xx. part 3, No. 79	1
Address, delivered at the Anniversary, 19th July, 1864, pre-faced by the announcement of award of Wollaston Medal, &c. By Prof. Ramsay, F.R.S. and President of the Society	1

FROM SMITHSONIAN INSTITUTE, WASHINGTON, per NATURAL HISTORY SOCIETY, MONTREAL.

Meteorologische Waaenemingen in Nederland; On Zijire Bezittingen en Afwijkingen, &c., 1863	1
Mitcheilengen der Kasserlich Koniglichen Geographischen Gesellischaft, VII., Jahngang, 1863; VI., Jahngrang, 1862	2
Verhandlungen der Kierserlish Koniglichen Zoologisch Botonischen Gesellschaft in Wien XIV. Band	1

FROM CHEWETT & CO.

Canadian Almanack, bound, one Vol., years 1861–1865	1

FROM PROF. A. D. BACHE, SUPT. U. S. COAST SURVEY.

United States Coast Survey, 1862	1
Do do do	1

UNKNOWN.

The Law of Increase and the Structure of Man. By F. P. Leharzick, Vienna, 1862	1

FROM DR. D. WILSON, TORONTO.

Smithsonian Report, 1862	1

From Hon. J. M. Broadhead, Washington.

Report of the Commissioner of Patents, 1861—Arts and Manufactures, vols. 1 and 2	1
Report of the Superintendent of the Coast Survey, 1862. Vol. 9, 1862–'63.	1
Results of Meteorological Observations made under the directions of the U. S. Patent Office and the Smithsonian Institution, from 1854 to 1859, inclusive. Vol. 2, part 1	1

From the Office of Routine and Record.

Statues of Canada, 1865	1

From the Author.

On Diseases of the Throat and Windpipe, &c. By George Duncan Gibb, M.D., M.A., London	1

From the Author.

Preliminary Report of the Geology of New Brunswick, &c. By H. Y. Hind, M.A., F.R.G.S., 1865	1*

From P. McGregor, Esq., Toronto.

Bailey's Astronomical Tables, &c	1

From the Society.

Proceedings of the Literary and Philosophical Society of Liverpool, during the 53rd Session, 1863-'64, No. XVIII	1*

From T. C. Wallbridge, M.P.P.

List of Post Offices in Canada, 1865	1*

From Geological Survey of India.

Palaeontology of Niti in the Northern Himayla, being descriptions and Figures of the Secondary Fossils, collected by Col. Richard Strachey, R.E., &c	2*

From Alex. McEwen, Esq., Toronto.

Examen de Ingeniis or the Tryal of Wits, &c., published originally in Spanish by Doctor Juan Huartes, and made English from the most correct Edition by Mr. Bellamy; London, 1698	1

From H. Rowsell, Esq., Toronto.

The Englefield Vases, 1819	1

DONATIONS OF PAMPHLETS, SHEETS, &c.

Union of the Colonies of British N. America, by P. S. Hamilton, Barrister at Law, &c., Novia Scotia. Received by post	1
On the Temperature of Insects and its connection with the functions of Respiration and circulation in this class of Invertebrated animals. By G. Newport, Esq. By post	1

From G. A. Gilbert, Esq., Toronto.

Two Photographs. (1.) Young Native (Female) of Australia 9 years old, married. (2.) Two married Females, Australian (Nictoria) Nations	2

From T. C. Wallbridge, M.P.P.

List of expiring Laws, (Legislative Assembly.)	1
The St Alban's Raid. Investigation	1
Annual Report of the Chamber of Commerce, St. John, N. B.	1

From the Department of Education, U. C.

Remarks on the new separate school agitation, 1865	1

By Post.

Annual Report of the Librarian of the Historical Society of Pennsylvania, 1864, Jan. 9, 1865	1

By Col. Graham, U. S. Civil Engineers.

Proceedings of the American Philosophical Society, Jan.–June, 1859; Vol. VII., No. 61	1

From the Author.

The Soils and Subsoils of Michigan. By Alex. Winchell, A.M., Professor of Geology, Michigan University	1
Notes on Selander Cerasi, Harris, as it occurs at Ann Harbor. By the same	1

From Christiania, per Smithsonian Institute.

Mindesonerker af middelalderens Kunst i Norge Udvique Foreningen til Norske Fortid smindesmerkers Bevaring med Text af N. Nicolaysen, 1855	1
Do do do do	1
Do do do do	1
Norske Bygninger Fra Fortiden—Norwegian Buildings from Former Times. J. Tegninger og med Text Udgivne af Foreningen til Norske Fortids mindesmerkers Bevaring-Fjerde Hefte Pl. XIII.—XVI. og Pag 5–8	1
Om de Geologiske Forhold Paa Kyststraekningen af Norde Bergenhus Amt, af M. Irgens og Th. Hiortdahl, 1864	2
Om Sneebraeen Folgefon af S. A. Sexe, 1864	1
Foreningen til Norske Fortidsmindesmerkers Bevaring aarsberetning for 1863	1
Det Kongelige Norske Frederiks Universitets aarsbereting for Aaret, 1862	1
Beretning om Bodsfaengflets Verksombed i aaret, 1863	1
Nyt Magazin for Naturvidenskaberne udgives af den physiographiske Forening i Christiania ved M. Sarsog Th. Kjerulf	1
Tolvte Binds fjerde Hefte, 1863	
Do Trettende Binds Tredie Hefte, 1864	1
Do Trettende Binds forste ogandet Hefte, 1864	1
General beretning fra Gustad Sindssygeasyl for aaret, 1863	1
Forhandlinger i Videnskabs Selskabet I Christiania aar, 1863	1

Saerskilt aftryk af Vindenskabs-Selskabets Forhandlinger for 1862	1
Index Supplementarius Locorum Natalium Specialium Plantarum Nonnullarum Vascularium in Provincia Artica Norvegiæ Spoute Nascentium qvas Observavit. J. M. Norman. Nedarosiæ, 1864	1
Page 619–5, Erlanterungen zur Uebersuhlskarte der Glacial-Formation am Christiania Fjord	1
Norges Fifterur af O. H. Loberg, 1864	1
Norske Fornlevninger, &c., &c.	1
Analytical and Critical Synopsis of a Selection of Piano-Forte Literature, &c., given before the Montreal Club, 25th May, 1865, by Dr. James Pich, Graduate in Music, New College, Oxford, &c. By post	1
Preliminary List of Plants of Buffalo and its Vicinity. By George W. Clinton, &c. By post	1
Calendar of McGill College and University, Montreal. Session of 1865–6	1
Annuaire de l'Universite-Laval, 1865-66	1
Historical Sketch of the early movement in Illinois for the Legalization of Slavery, &c. By Hon. W. H. Brown, Chicago Historical Society	1
Faculty of Medicine, McGill University, Montreal, 1865–66. By post	1
The Report of the Observatory, Harvard College, 8th March, 1865	1
Petroleum: its Geological Relations considered with especial reference to its occurrence in Gaspe, &c. By T. Sterry Hunt, L.L.D., F.R.S., &c.	1

FROM THE LINNÆAN SOCIETY.

Journal of Proceedings—

Zoology, Vol. VIII. No. 30, Jan. 13, 1865	1
Botany, do No. 31, Dec. 12, 1864	1
Do do No. 32, Feb. 17, 1865	1
Do Vol. IX. Nos. 33 and 34, June 12, 1865	1
List of the Society, 1864	1

FROM THE ROYAL IRISH ACADEMY.

The Proceedings of—

Vol. 1, Year 1836–7, Part 1, No. 1	1
" 1, " 1838–9, " 2, No. 14	1
" 1, " 1839, " 3, No. 19	1
" 2, " 1841–2, " 6, No. 31	1
" 2, " 1842–3, " 7, No. 36	1
" 2, " 1843–4, " 8, No. 42	1
" 3, " 1844–5, " 1, No. 48	1
" 3, " 1845, " 2, No. 51	1
" 3, " 1846–7, No. 56	1
" 4, " 1848	1
" 4, " 1848, " 1	1
" 4, " 1849, " 3	1
" 5, " 1850–53, bound in cloth	1
" 6, " 1853–4, Part 1	1
" 6, " 1855–6, " 3	2

Vol. 6, Year 1856, Part 4	1
" 7, " 1857, " 1 and 2	1
" 7, " 1858, " 3, 4, 5, 6, 7	5
" 7, " 1859, " 8	1
" 7, " 1860, " 9	1
" 7, " 1860, " 10	1
" 7, " 1860, " 11	1
" 7, " 1861, " 12	1
" 7, " 1871, " 13	1
" 7, " 1861, " 14	1
" 7, " 1862, Index to Vols. 1–7 and By-Laws	1
" 8, " 1861	1
" 8, " 1861, Part 1	1
" 8, " 1862, " 2	1
" 8, " 1863, " 3	2
" 8, " 1863, " 4	2
" 8, " 1863, " 5	2
" 8, " 1864, " 6	2
The Transactions of the Royal Irish Academy,	
Vol. 24, 1862, Antiquities, Part 1	1
" " " " 2	1
" " Polite Literature, " 1	1
" " Science, " 3	1

From the Historical Society, Chicago.

Fourth Annual Report Board of Works, City of Chicago	1
Seventh Annual Statement of the Trade and Commerce of Chicago, 31st March, 1865	1

From Dr. Rosebrugh, Toronto.

Canada Medical Journal, Montreal; by G. E. Fenwick and F. W. Campbell, M.D. and L.R.C.P.S.	
Vol. 1, Year 1864, Nos. 1, 2, 3, 4, 7, 9, 11, & 12	8
" 2, " 1865, " 1 & 4	2
The Buffalo Medical and Surgical Journal; by Julius F. Moirer, M.D.	
Vol. 3, Nos. 11 & 12, 1864	5
" 4, " 1 & 3, 1864; Nos. 6, 8, 9, 10, 11, & 12, 1865	8
" 5, " 1 & 3, 1865	2

From the Office of Routine and Record.

Annual Report of Pierre Fortin, Esq., on the Fisheries in the Gulph of St. Lawrence, for 1864	1
Report of the Board of Instructions of Asylums and Prisons, &c., for 1864.	1

Books Purchased.

Journal of the Board of Arts and Manufactures. Vol. 3, 1863, Vol. 4, 1864. *Binding only paid for*	2
Carlyle's History of Frederick the Great. Vols. 5 & 6	2

IN EXCHANGE FOR JOURNAL.

The Journal of Education Upper Canada [Dept.], 1865	1
The Journal of the Franklin Institute Philadelphia, 1865	1
The Artizan, London, 1865	1
The Journal of the Society of Arts, London, 1865. Duplicate	1
Silliman's American Journal, 1865	1
Canadian Naturalist and Geologist, 1865	1
Journal of Education, Lower Canada, 1864	1
Journal de l' Instruction Publique, Lower Canada, 1864	1
Journal of the Geological Society of Dublin	1
Transactions of the Royal Society of Edinburgh. Vol. XXIII., Pt. 3, session 1863–4	1
Proceedings of do., 1863–4	1
Proceedings of the Natural History Society of Philadelphia, 1865	1
Historical Collections of the Essex Institute, 1865	1
Proceedings of do.	1
Annales des Mines, 1864–5	1
Proceedings of the Boston Natural History Society, 1865	1
Proceedings of the Leeds Philosophical Institute	1
Annals of the Lyceum of Natural History New York	1
Journal of the Board of Arts, Toronto, 1865	1
Transactions of the Royal Scottish Society of Arts	1
Anthropological Review, London	1
Journal of Royal Dublin Society	1
Proceedings of the American Society of Antiquaries	1
Transactions of the Literary and Historical Society, Quebec	1
Proceedings of the Antiquarian Society of Scotland	1
Memoirs of the Geological Survey of India	1

DONATIONS FOR MUSEUM, 1865.

FROM G. A. GILBERT, TORONTO.

Iron Pyrites from Peru. Specimen	1

PER SANDFORD FLEMING, ESQ., C.E.

Iron Ore,	From Acadian Iron Works, Nova Scotia. Specimens	1
Iron Pig,		1
Iron Bar,		1
Coal from Newcastle River, near the head of Grand Lake, New Brunswick. Specimen		1

SAMUEL SPREULL, TORONTO.

Coins, small copper, French, 1855. Specimen	1

GENERAL METEOROLOGICAL

Provincial Magnetical Observ

LATITUDE, 43° 39′ 4″ North; LONGITUDE, 5h. 17m. 33s. West.—Elevation above

	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JUL.
Mean temperature	17°.75	22°.36	33° 55	43°.09	52°.29	64°.47	65°.02
Difference from average (25 years)	— 5.86	— 0.63	+ 3.69	+ 2.13	+ 0.61	+ 3.13	— 1.96
Thermic anomaly (Lat 43° 40′)	—15.05	—12.34	— 6.55	— 7.11	— 5.81	— 0.13	— 3.68
Highest temperature	37.2	42.2	55.6	62.5	79.0	90.2	83.0
Lowest temperature	— 9.0	—10.0	— 3.5	23.0	30.0	43.0	45.8
Monthly and annual ranges	46.2	52.2	59.1	39.5	49.0	47.2	37.2
Mean maximum temperature	24.60	28.64	39.29	50.67	61.24	74.19	74.14
Mean minimum temperature	10.09	15.52	25.11	34.93	43.65	56.73	55.63
Mean daily range	14.52	13.12	14.18	15.74	17.60	17.46	18.50
Greatest daily range	31.4	26.0	26.8	30.0	27.0	36.9	29.0
Mean height of barometer	29.5886	29.7024	29.5277	29.6169	29.5850	29.6327	29.5948
Difference from average (18 years)	—.0448	+.0902	—.0546	+.0299	+.0004	+.0703	—.0066
Highest barometer	30.191	30.232	30.058	30.156	30.003	29.877	29.976
Lowest barometer	29.114	29.082	28.707	28.980	29.179	29.232	29.247
Monthly and annual ranges	1.077	1.150	1 351	1.176	0.824	0.645	0.729
Mean humidity of the air	81	83	79	72	69	70	65
Mean Elasticity of aqueous vapour	.086	.105	.159	.203	.278	.432	.402
Mean of cloudiness	.70	.71	.78	.64	.53	.62	.53
Difference from average (13 years)	—.02	.00	+.17	+.04	.00	+.10	+.05
Resultant direction of the wind	N 85 W	N 23 W	N 61 W	N 84 W	N 3 W	S 30 W	N 86 W
" velocity of the wind	4 80	3.95	2.16	2.11	1.65	0.60	2.28
Mean velocity (miles per hour)	9.39	8.23	8.80	8.39	5.48	4.06	5.34
Difference from average (17 years)	+1.37	—0.11	+0.13	+0.33	— 1.11	—1.21	+0.37
Total amount of rain	0.440	0.810	3.050	3.972	4.005	2.005	2.470
Difference from average (24 & 25 yrs)	—0.891	—0.190	+1.493	+1.539	+0.799	—0.862	—1.004
Number of days rain	1	5	10	17	11	7	11
Total amount of snow	14.8	16.8	18.9	2.0	0.0	0.0	0.0
Difference from average (22 years)	— 0.35	— 1.25	+ 9.80	— 0.40	— 0.09	...	...
Number of days snow	18	11	12	6	0	...	...
Number of fair days	13	13	13	9	20	23	20
Number of auroras observed	3	4	2	4	5	5	7
Possible to see aurora (No. of nights)	13	13	11	14	20	18	24
Number of Thunderstorms	0	0	1	1	2	2	4

REGISTER FOR THE YEAR 1865.

atory, Toronto, Canada West.

Lake Ontario, 108 Feet; approximate Elevation above the Sea, 342 Feet.

AUG.	SEP.	OCT.	NOV.	DEC.	Year 1865.	Year 1864.	Year 1863.	Year 1862.	Year 1861.	Year 1860.	Year 1859.
°	°	°	°	°	°	°	°	°	°	°	°
65.18	64.49	44.54	38.58	27.71	44.92	44.70	44.57	44.35	44.22	44.32	44.19
— 1.03	+ 6.65	— 1.11	+ 1.83	+ 1.51	+ 1.75	+ 0.53	+ 0.40	+ 0.18	+ 0.05	+ 0.15	+ 0.02
— 3.32	+ 2.99	— 9.26	— 4.62	— 8.29	— 6.08	— 6.30	— 6.43	— 6.65	— 6.78	— 6.68	— 6.81
87.8	90.5	71.4	63.2	54.2	90.5	94.0	88.0	95.5	87.8	88.0	88.0
44.4	42.0	21.6	23.6	5.7	—10.0	—15.0	—19.8	— 5.2	—20.8	— 8.5	—26.5
43.4	48.5	49.8	39.6	48.5	100.5	109.0	107.8	100.7	108.6	96.5	114.5
74.95	74.07	52.29	44.85	34.73	...	...	...	...	...	...	...
55.42	57.10	38.07	32.91	23.33	...	...	...	...	...	...	...
19.54	16.97	14.22	11.94	11.41	15.43	14.57	14.73	14.43	14.42	14.24	13.66
30.8	24.9	24.8	24.2	30.6	36.9	37.4	39.6	37.0	33.3	30.7	39.8
29.6799	29.7180	29.6187	29.6548	29.6761	29.6330	29.5596	29.6536	29.6248	29.6008	29.5923	29.6209
+.0586	+.0551	—.0313	+.0409	+.0281	—.0197	+.0537	+.0403	+.0115	—.0125	—.0210	+.0076
29.959	30.021	30.045	30.354	30.151	30.354	30.327	30.502	30.469	30.330	30.267	30.392
29.308	29.443	28.779	28.949	28.926	28.707	28.671	28.704	28.805	28.644	28.838	28.286
0.651	0.578	1.266	1.405	1.225	1.647	1.656	1.798	1.664	1.686	1.429	2.106
69	75	77	77	79	75	76	77	77	78	77	74
.434	.458	.240	.186	.129	.259	.263	.266	.262	.262	.260	.249
.38	.39	.58	.79	.73	.61	0.65	0.61	0.63	0.62	0.60	0.61
—.09	—.10	—.05	+.05	—.02	+.01	+ .05	+ .01	+ .03	+ .02	.00	+ .01
N 60 W	S 56 E	N 36 W	N 79 W	S 81 W	N 66 W	N 76 W	N 41 W	N 48 W	N 56 W	N 60 W	N 61 W
1.55	0.47	0.58	2.98	3.07	1.98	2.49	1.34	2.03	2.11	3.32	2.24
5.07	4.12	7.26	7.90	7.33	6.78	7.40	7.13	7.33	7.47	8.55	8.17
—0.11	—1.42	+1.12	+0.43	—0.99	—0.10	+0.54	+0.27	+0.47	+0.61	+1.69	+1.31
1.990	2.450	2.705	0.975	1.727	26.599	29.486	26.483	25.529	26.995	23.434	33.274
—1.036	—1.280	+0.175	—2.173	+0.086	—3.344	—0.469	—3.472	—4.426	— 2.960	—6.521	+3.319
8	12	17	5	7	111	132	130	118	136	130	127
0.0	0.0	4.5	1.1	5.2	63.3	74.6	62.9	85.4	74.8	45.6	64.9
...	...	+ 3.72	— 2.02	— 9.49	— 0.06	+11.24	— 0.46	+22.04	+11.44	—17.76	+ 1.54
...	...	3	7	11	68	70	74	72	76	75	87
23	18	14	21	14	201	180	181	189	165	174	169
8	7	9	1	0	55	34	44	48	43	58	53
22	23	19	11	13	201	158	182	176	180	190	199
4	2	1	0	0	17	20	24	24	27	30	30

In the following summary several of the results of the year 1865 are compared with the averages derived from a series of years, as well as with the extreme values of analogous results given by the same series:

TEMPERATURE.

	1865.	Average of 25 years.	Extremes.	
Mean temperature of the year	44°.92	44°.17	46°.36 in '46.	42°.16 in '56.
Warmest month	August.	July.	July, 1854.	Aug. 1860.
Mean temperature of the warmest month	65.18	66.98	72.47	64.46
Coldest month	January.	February	Jan. 1857.	Feb. 1848.
Mean temperature of the coldest month	17.75	22.99	12.75	26.60
Difference between the temperatures of the warmest and the coldest month	47.43	43.99	——	——
Mean of deviations of monthy means from their respective averages of 25 years, signs of deviation being disregarded	2.51	2.33	3.58 in 1857.	1.36 in '64.
Months of greatest deviation, without regard to sign	Septem'er	January.	Jan. 1857.	——
Corresponding magnitude of deviation	6.7	3.7	10.8	——
Warmest day	Aug. 3.	——	July 12, '45.	July 31, '44.
Mean temperature of the warmest day	76.67	77.45	82.32	72.75
Coldest day	Jan. 17.	——	Feb. 6, '55 Jan. 22, '57	Dec. 22, '42.
Mean temperature of the coldest day	1.77	—1.02	—14.38	9.57
Date of the highest temperature	Sept. 14.	——	Aug. 24, '54.	Aug. 19, '40.
Highest temperature	90.5	90.6	99.2	82.4
Date of the lowest temperature	Feb. 13.	——	Jan. 26, '59.	Jan. 2, '42.
Lowest temperature	—10.0	—12.4	—26.5	1.9
Range of the year	105.5	103.0	118.2	87.0

BAROMETER.

	1865.	Average of 18 years.	Extremes.	
Mean pressure of the year	26.6330	29.6133	29.6679 in 1849.	29.5596 in 1864.
Month of highest mean pressure	Septem'er	Septem'er	Jan. 1849.	June, 1864.
Highest mean monthly pressure	29.7180	29.6629	29.8030	29.6545
Month of lowest mean pressure	March.	June.	March, 1859.	Nov. 1849.
Lowest mean monthly pressure	29.5277	29.5624	29.4125	29.5868
		Average of 25 years.		
Date of highest pressure in the year	Nov. 10. 9 p.m.	——	Jan. 8. 1855.	October 22 1845.
Highest pressure	30.354	30.364	30.552	30.242
Date of lowest pressure in the year	March 22, 11 a.m.	——	March 19, 1859.	March 17, 1845.
Lowest pressure	28.707	28.681	28.286	28.939
Range of the year	1.647	1.683	2.106 in 1859.	1.303 in 1845.

RELATIVE HUMIDITY.

	1865.	Average of 20 years.	Extremes.	
Mean humidity of the year	75	78	82 in 1851.	73 in 1858.
Month of greatest humidity	February	January.	Jan. 1857.	Dec. 1858.
Greatest mean monthly humidity	83	83	89	81
Month of least humidity	July.	May.	Feb. 1843.	April, 1849.
Least mean monthly humidity	65	72	58	76

EXTENT OF SKY CLOUDED.

	1865.	Average of 13 years.	Extremes.	
Mean cloudiness of the year	0.61	0.60	0.65	0.57
Most cloudy month	Novemb'r	December	—	—
Greatest monthly mean of cloudiness	0.79	0.75	0.83	0.73
Least cloudy month	August.	August.	—	—
Lowest monthly mean of cloudiness	0.38	0.47	0.30	0.45

WIND.

	1855.	Result of 17 years.	Extremes.	
Resultant direction	N 66° W	N 59° W	—	—
Mean resultant velocity in miles	1.98	1.83	—	—
Mean velocity, without regard to direction	6.78	6.88	8.55 in 1860.	5.10 in 1853.
Month of greatest mean velocity	January	March.	March, 1860	Jan. 1848.
Greatest monthly mean velocity	9.39	8.67	12.41	5.82
Month of least mean velocity	June.	July.	Aug. 1852.	Sept. 1860.
Least monthly mean velocity	4.06	4.97	3.30	5.79
Day of greatest mean velocity	April 12.		Mar'h 19, '59	Dec. 2, 1848.
Greatest daily mean velocity	19.40	23.14	31.16	15.30
Day of least mean velocity	August 13			—
Least daily mean velocity	Calm.			—
Hour of greatest absolute velocity	April 12 1 to 2 p.m.		Dec. 29, '61. 9 to 10 a. m.	Mar'h 14, '53 11 a.m. to n.
Greatest velocity	44.3	39.79	46.0	25.6

RAIN.

	1865.	Average of 23 years.	Extremes.	
Total depth of rain in inches	26.599	29.955	43.555 in 1843.	21.505 in 1856.
Number of days in which rain fell	111	108	130 in 1861.	80 in 1841.
Month in which the greatest depth of rain fell	May.	Novemb'r	Sept. 1843.	Sept. 1848.
Greatest depth of rain in one month	4.005	3.765	9.760	3.115
Month in which days of rain were most frequent	April & Oct	October.	Oct. 1864.	May, 1841.
Greatest number of rainy days in one month.	17	13	22	11
Day in which the greatest amount of rain fell	May 17.	—	Sept. 14, '43.	Sept. 14, '48.
Greatest amount of rain one day	2.220	2.067	3.455	1.00

SNOW.

	1865.	Average.	Extremes.	
Total depth in the year in inches	63.3	63.4	99.0 in 1855.	38.4 in 1851.
Number of days in which snow fell	68	59	87 in 1859.	33 in 1848.
Month in which the greatest depth of snow fell	March.	February.	Feb. 1846.	Dec. 1851.
Greatest depth of snow in one month	18.9	18.1	46.1	10.7
Month in which the days of snow were most frequent	January.	December	Dec. 1859 Jan. 1861	Feb. 1848.
Greatest number of days of snow in one month	18	13	23	8
Day in which the greatest amount of snow fell	Jan. 10.	—	Feb. 5, '63	Feb. 26, 1854 Jan. 10, 1857
Greatest fall of snow in one day	7.0	8.5	16.0	5.5

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JANUARY, 1866.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17.33 min. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M		6 A. M.	2 P. M.	10 P.M.	Result'.	ME'N		
1	29.683	29.696	29.896	29.7692	34.9°	33.1°	24.1°	30.02°	+ 4.80°	.176	.116	.100	.126	86	61	77	74	S W b S	W b S	W S W	S 81° W	9.6	22.0	7.8	10.92	11.4	...	...
2	.940	.842	.749	.8370	18.3	28.0	23.3	23.13	— 2.07	.080	.117	.095	.098	81	76	75	78	Calm.	S b W	Calm.	S 17 W	0.0	5.6	0.0	1.75	1.8	...	...
3	.612	.581	.560	.5800	23.0	29.8	28.0	26.88	+ 1.73	.106	.117	.139	.123	86	71	90	84	Calm.	S W	W S W	S 71 W	0.0	4.5	7.5	6.22	6.9	...	0.1
4	.516	.656	.920	.7175	23.0	14.0	- 2.6	9.83	—15.30	.106	.056	.033	.061	86	68	87	80	N W b W	N W	N b W	N 44 W	13.4	30.6	12.0	13.49	14.6	...	0.1
5	.878	.863	.870	8643	- 3.3	8.2	13.6	7.63	—17.50	.035	.035	.079	.053	90	54	98	82	Calm.	N W b W	S W b W	N 74 W	0.0	7.5	17.0	6.85	10.0	...	inap.
6	30.027	30.079	30.159	30.0935	5.7	3.5	4.6	4.23	—20.90	.047	.044	.043	.044	82	86	78	83	N b E	N N E	N N E	N 12 E	8.2	8.0	2.0	7.75	7.9	...	0.2
7	30.470	30.651	30.831	30.6720	-10.2	- 7.0	- 9.8	-9.48	—34.62	.027	.025	.021	.023	96	81	79	83	N N E	N N W	N	N 1 W	6.4	9.5	10.2	10.03	10.1	...	...
8	30.898	30.837	30.777	30.8357	-13.0	6.6	4.2	-0.48	—25.62	.024	.031	.052	.034	95	51	100	77	N	N W b W	N N W	N 18 W	12.5	6.5	8.0	5.95	6.1	...	...
9	30.655	30.498	30.357	30.4928	0.6	16.5	7.8	8.02	—17.12	.043	.064	.051	.053	94	68	82	84	N N W	Calm.	Calm.	N 38 W	1.6	0.0	0.0	0.34	0.3	...	...
10	30.144	29.911	29.751	29.9170	11.4	25.5	26.2	21.60	— 3.45	.062	.125	.131	.108	85	91	92	89	N W b W	S W b S	S W	S 42 W	1.0	9.0	6.0	6.13	6.31	...	0.4
11	29.727	.740	.743	.7362	26.6	33.4	32.2	30.92	+ 5.87	.126	.163	.175	.159	87	85	96	91	S W	S W b W	Calm.	S 29 E	2.0	4.4	0.0	1.64	3.6	...	1.2
12	.624	.400	.262	.4082	30.9	30.9	31.3	31.15	+ 6.07	.164	.168	.174	.170	94	97	99	97	E	E N E	E b N	N 75 E	14.6	14.0	10.6	11.34	11.4	.055	1.0
13	.172	.364	.623	.4137	33.8	28.4	12.5	23.82	— 1.27	190	134	.067	.123	98	86	88	89	N E	N W b N	N W b N	N 43 W	5.5	16.8	13.0	12.73	14.77	...	0.3
14	.927	30.116	—	—	3.3	0.3	—	—	—	.032	.033	—	—	87	73	—	—	N N W	N N W	N b E	N 8 W	8.0	10.0	6.9	7.58	8.2	...	...
15	30.176	29.914	.375	.7815	2.4	14.7	20.8	13.23	—11.87	.050	.078	.103	.079	100	93	92	93	N E b N	E	E	S 87 E	9.8	18.5	25.8	15.95	18.5	...	3.0
16	29.110	.293	.501	.3232	33 8	23.3	24.1	26.58	+ 1.58	.158	.089	.100	.114	81	71	77	77	S W b S	S W b W	S W b W	S 53 W	18.0	21.5	16.2	17.24	17.31	...	0.2
17	.581	.399	.401	.4555	24.1	29.5	28.4	26.72	+ 1.70	.100	.121	.119	.109	77	74	76	74	S W b S	S W	W	S 57 W	15.5	9.8	8.6	9.23	9.7	...	inap.
18	.429	.428	.522	.4600	23.7	34.5	25.2	27.62	+ 2.65	.112	.144	.115	.123	87	72	85	82	Calm.	W b N	W N W	N 20 E	0.0	10.2	2.6	1.18	4.6	...	inap.
19	.426	.489	.411	.4343	29.8	32.0	34.2	32.32	+ 7.43	.154	.158	.185	.169	93	87	93	92	E b N	E N E	E N E	N 75 E	11.3	3.2	8.8	5 91	6.5	.317	...
20	.130	.592	.796	.5350	42.1	15.8	7.5	21.17	— 3.68	.259	.060	.044	.114	96	66	72	78	S W b S	W	W S W	S 72 W	7.0	30.0	22.5	24.08	24 37	.085	inap.
21	.755	.716	—	—	5.3	12.5	—	—	—	.046	.050	—	—	82	64	—	—	W S W	W b S	W S W	S 66 W	21.8	23.2	19.6	20.11	20.2	...	...
22	.641	.769	.879	.7752	13.2	16.5	7.8	12.57	—12.20	.071	.064	.051	.060	90	68	82	78	W S W	W b S	Calm.	S 80 W	15.5	22.2	0.0	9.11	9.21	...	inap.
23	.935	.901	.980	.9458	8.9	21.2	15.8	15.23	— 9.43	.055	.066	.065	.063	84	57	74	73	W b N	W	Calm.	N 63 W	1.2	4.0	0.0	1.56	1.7	...	...
24	.999	.907	.723	.8585	14.7	24.1	24.1	20.65	— 3.9	.072	.107	.114	.096	85	82	87	84	N	E b N	E b N	N 70 E	6.8	11.4	15.6	12.35	13.1	...	2.5
25	.419	.401	.538	.4583	27.0	22.6	20.3	23.27	— 1.32	.136	.097	.096	.111	93	80	88	88	E	N W b N	Calm.	N 2 E	17.6	10.6	0.0	4.67	6.52	..	1.0
26	.558	.591	.715	.6293	17.6	21.2	19.0	19.18	— 5.13	.088	.079	.085	.082	92	70	83	80	Calm.	N W	N W b N	N 31 W	0.0	5.5	4.8	5.36	5.61	...	0.1
27	.778	.811	.787	.7918	18.6	21.9	21.5	20.85	— 3.50	.090	.084	.095	.091	89	71	82	81	N	N N E	N N E	N 57 E	5.0	3.2	1.5	2.15	4 51	...	...
28	.693	.629	—	—	22.3	24.1	—	—	—	.107	.100	—	—	89	77	—	—	S E b S	Calm	S E b S	S 54 E	3.6	0.0	2.4	3.16	4.1	...	...
29	.651	.659	.621	.6485	23.0	27.0	30.2	26.92	+ 2.72	.106	.129	.149	.129	86	88	89	88	N E	E N E	S E b E	N 87 E	5.6	6.0	7.5	4.78	5.81	...	...
30	.408	.246	.470	.3775	32.7	36.0	27.7	31 72	+ 7.62	.165	.180	.128	.154	88	85	84	85	S E	W S W	W b S	S 79 W	9.2	8.0	8.6	7.70	10.6	.065	inap.
31	.388	.255	.186	.2565	19.7	30.6	23.3	24.90	+ 0.92	.096	.086	.095	.095	91	51	75	72	W b N	W b S	W b S	S 84 W	9.0	21.5	3.2	12.90	13.2	...	0.2
M	29.7224	29.7082	29.7249	29.7184	19.38	23.29	19.82	20.73	— 4.07	.106	.100	.099	.101	89	74	85	83	......	......	......	......	7.73	11.52	8.02	...	9.34	.522	10.3

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY, 1866.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 30.940 at 8 a.m. on 8th. } Monthly range=
Lowest Baromoter . . . . 29.110 at 6 a.m. on 16th. } 1.830 inches.
Self-registering Ther. { Maximum Temperature . . . . . -44°.0 on 20th. } Monthly range=
Minimum Temperature . . . . . -14°.0 on 8th. } 58°.0
Mean Maximum Temperature . . 26°32 } Mean daily range=13°62
Mean Minimum Temperature . . 12°70 }
Greatest daily range . . . . 40°8 from a.m. of 15th to a.m. of 16th.
Least daily range . . . . 3°8 from a.m. to p.m. of 1st.
Warmest day . . . . 19th...Mean Temperature . . . 32°32 } Difference=41°.80
Coldest day . . . . . 7th...Mean Temperature . . . 9°48 }
Maximum Radiation. { Solar . . . . 90°5 on 31st. } Monthly range=
Terrestrial . . . . -19°8 on 8th. } 110°.3
Aurora observed on 3 nights, viz.—2nd, 8th and 20th.
Possible to see Aurora on 11 nights; impossible on 20 nights.
Snowing on 19 days; depth 10.3 inches; duration of fall 78.9 hours.
Raining on 4 days; depth 0.522 inches; duration of fall 20.0 hours.
Mean of cloudiness=0 76; most cloudy hour observed, 2 p.m.; mean=0.80; least cloudy hour observed, 10 p.m.; mean=0.67.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2059.61	1503.85	1527.81	3673.06

Resultant Direction, N. 75° W.; Resultant Velocity, 2.98 miles per hour.
Mean Velocity, 9.34 miles per hour.
Maximum Velocity, 32.0 miles, from noon to 1 p.m. on 20th.
Most windy day. 20th—Mean velocity 24.37 miles per hour. } Difference,
Least windy day, 9th—Mean velocity 0.35 miles per hour. } 24.02 miles
Most windy hour, 11 a.m.—Mean velocity 12.09 miles per hour. } Difference,
Least windy hour, 6 a.m.—Mean velocity 7.67 miles per hour. } 4.33 miles

The reading of the Barometer at 8 a.m. of the 8th, 30.940 is the highest entry yet recorded; the highest previously recorded being 30.552 on the 8th of January, 1855.

The mean temperature of the 7th is the third lowest recorded, being excelled by the 6th February, 1855, and the 22nd January. 1857, the temperature of these being in both cases —14.38. January, 1866, may be classed as cold, dry, and windy.

1st. Lunar halo. 4th. Lunar corona. 7th. Very cold day. 15th. Very stormy day. 21st. Solar halo and parhelia. 23rd. Solar halo. 20th. Very rapid change of temperature, falling about 27° in about 6 hours.

COMPARATIVE TABLE FOR JANUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity.
1840	17.0	— 6.6	40.6	-13.8	54.4	4	1.395	11	...	...	...	...
1841	25.6	+ 2.0	41.7	—4.1	45.8	2	2.150	14	...	...	...	0.36 lbs
1842	27.9	+ 4.3	45.8	1.3	44.5	5	2.170	9	...	...	...	0.78 "
1843	28.7	+ 5.1	54.4	1.5	52.9	6	4.295	12	14.2	...	...	0.69 "
1844	20.2	— 3.4	44.6	—7.7	52.3	7	3.005	11	24.9	...	...	0.70 "
1845	26.5	+ 2.9	43.0	—3.4	46.4	5	imper	9	22.7	...	...	0.70 "
1846	26.7	+ 3.1	41.2	0.3	40.9	5	2.335	10	6.0	...	...	0.55 "
1847	23.3	— 0.3	42.6	—2.2	44.8	7	2.135	5	7.5	...	...	1.09 "
1848	28.7	+ 5.1	51.5	-12.0	63.5	7	2.245	8	7.1	N 82 W	2.03	5.82 ms
1849	18.5	— 5.1	40.1	-15.2	55.3	4	1.175	10	9.2	N 63 W	3.06	6.71 "
1850	29 7	+ 6.1	46.3	10.6	35.7	5	1.250	8	5.2	N 37 W	0.69	5.80 "
1851	25.5	+ 1.9	43.2	-12.8	56.0	4	1.275	10	7.8	S 77 W	3.21	7.69 "
1852	18.4	— 5.2	37.3	—7.0	44 3	0	0.000	19	30.9	N 68 W	3.14	7.67 "
1853	23.0	— 0.6	40.9	—6.6	47.5	1	0.290	6	7.5	N 27 W	2.52	6.34 "
1854	23.6	— 0.0	45.2	—4.3	49.5	7	1.270	11	7.5	N 77 W	2.44	6.91 "
1855	25.9	+ 2.3	48.2	—4.7	52 9	5	0.525	13	23.3	N 73 W	1.91	7.26 "
1856	16.0	— 7.6	33.1	-12.1	45.2	0	0.000	14	13.6	N 75 W	5.24	10.69 "
1857	12.8	—10.8	34.6	-20.1	54.7	3	Inapp	16	21.8	N 70 W	4.96	10.31 "
1858	30.0	+ 6.4	45.8	7.5	38.3	6	1.152	11	4.0	N 71 W	2.33	7.40 "
1859	26.4	+ 2.8	41.5	-26.5	68.0	6	1.440	19	16.4	S 81 W	3.17	8.76 "
1860	23.4	— 0.2	45.4	—5.1	50.5	6	0.740	16	8.7	N 89 W	6.09	9 37 "
1861	19.9	— 3.7	34.5	—7.0	41.5	4	0.685	23	20 6	N 86 W	2.92	9.30 "
1862	21.7	— 1.9	42.8	—1.9	44.7	5	0.115	19	27.4	N 26 W	2.69	8.83 "
1863	28.1	+ 4.5	44.6	-11.2	55.8	10	1.122	17	20.6	N 61 W	1.13	7.23 "
1864	22.8	— 0.8	42.5	—6.6	49.1	5	1.165	14	26.3	S 73 W	6.00	10.22 "
1865	17.7	— 5.9	35.6	—6.2	41 8	1	0.440	18	14.8	N 85 W	4.80	9.39 "
1866	20.7	— 2.9	42.1	-13.0	55.1	4	0.522	19	10.3	N 75 W	2.98	9.34 "
Results to 1864.	23.61	...	42.86	—6.52	49.38	4.8	1.331	12.6	15.15	N 77 W	2.92	8.02
Exc. for 1866.	—2.91	...	—0.76	—6.48	+5.72	— 0.8	— 0.809	+ 6.4	— 4.85	...	...	+1.32

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—FEBRUARY, 186 .

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2P.M.	10PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10PM	Re-sul't.	ME'N		
1	29.143	29.233	29.305	29.2400	20.1	19.0	16.1	18.15	— 5.73	.074	.085	.074	.077	66	82	83	77	W b N	W b N	W b S	N 80° W	12.5	23.0	10.8	13.62	13.98	...	...
2	.316	.253	.306	.2932	16.5	21.2	11.8	16.18	— 7.67	.076	.079	.063	.073	83	70	86	81	W b S	W b S	W	S 80 W	6 0	17.2	6.0	10.36	10 50	...	0.1
3	.367	.359	.480	.4140	14.0	18.7	13.2	14.58	— 9.18	.068	.063	.060	.062	83	62	75	73	W S W	W S W	W S W	S 72 W	12.0	23.0	18.2	16.78	17.01	...	...
4	.535	.646	—	—	7.8	11.4	—	—	—	.051	.051	—	—	82	69	—	—	W S W	N W	W N W	N 69 W	18.0	22.5	9.6	10.16	11.15	...	0.2
5	30.084	30.077	.936	30.0290	1.3	11.8	14.7	8.97	—14.62	.043	.047	.057	.049	91	61	67	74	N W b W	S W b W	S W b W	S 58 W	4.4	15.0	20.5	13.95	14.41	...	...
6	30.048	30.220	30.196	30.1663	15.4	9.6	8.5	11.43	—12.08	.070	.041	042	.051	80	60	67	68	W S W	N	N N E	N 4 W	13.3	11.8	7.0	5.06	9.52	...	Inp.
7	30.028	29.815	29.853	29.8930	18.3	25.9	27.3	23.77	+ 0.33	.080	.107	.111	.098	81	76	74	76	E S E	S S W	S W b S	S 1 W	6.0	6.0	6.0	2.42	3.13	...	...
8	29.779	.673	.677	.7042	26.6	29.8	24.1	26.35	+ 2.98	.126	.133	.120	.126	87	80	93	88	S W b S	N E b E	N E	N 37 E	2.5	7.0	3.5	5.24	5.99	...	2.5
9	.671	.574	.451	.5527	20.1	26.2	30.2	25.73	+ 2.47	.098	.116	.142	.120	91	82	84	86	N E b N	S b E	S E b S	S 34 E	3.8	6.6	6.5	4.19	5.15	...	...
10	.388	.440	.492	.4518	30.9	38.1	34.5	34.13	+10.87	.149	.187	.192	.176	86	81	96	89	Calm.	Calm.	N E b N	N 40 E	0.0	0.0	4.6	1.56	2.43	0.150	1.5
11	.454	.518	—	—	33.4	33.4	—	—	—	.180	.157	—	—	95	92	—	—	N N W	N	N W b N	N 15 W	12.1	14.5	6.6	10.71	10.94	...	3.5
12	.864	.759	.769	.7993	24.1	25.9	21.9	23.33	+ 0.08	114	.113	.099	.107	87	81	84	85	N b E	N N W	N	N 6 W	9.0	8.0	12.5	7.82	8.03	...	...
13	.774	.763	.777	.7723	18.3	30.9	27.7	25.70	+ 2.45	.080	.141	.135	.119	81	81	89	84	N N W	S W	W S W	S 72 W	5.6	4.0	5.7	2.03	4.24	...	0.6
14	.433	.149	.195	.2400	29.8	35.6	25.9	28.98	+ 5.72	.154	.160	.128	.141	93	77	91	87	E S E	S W	S W b W	S 52 W	11.0	10.0	22.0	12.95	16.02	...	1.5
15	.433	.657	.940	.7095	6.7	6.8	—5.9	2.73	—20.52	.052	.039	.028	.040	88	66	85	79	S W b W	N W b W	Calm.	N 62 W	15.0	17.6	0.0	7.73	8.07	...	...
16	30.076	30.089	.995	30.0532	—7.3	6.0	9.0	2.58	—20.78	.030	.049	.059	.044	92	85	91	84	N W b W	S W b W	S W	S 51 W	5.0	18.8	26.0	19.19	19.55	...	...
17	29.995	29.880	.800	29.8893	16.1	29.1	30.6	25.98	+ 2.63	.074	.111	.138	.103	83	69	80	73	S W b S	S W b S	S W	S 37 W	19.0	26.0	16.0	16.78	16.92	...	...
18	.819	.624	—	—	25.5	30.6	—	—	—	.118	.152	—	—	86	89	—	—	S W b W	Calm.	S E	S 21 W	6.8	0.0	2.6	3.13	3.71	...	5.0
19	.296	.167	.333	.2695	31.6	34.5	25.2	29.47	+ 5.93	.170	.149	.115	.144	96	75	85	87	S W b S	S W b W	W b N	S 74 W	2.8	10.4	10.0	5.98	6.84	...	0.5
20	.438	.579	.837	.6397	21.2	19.4	15.4	19.57	— 4.05	.105	.093	.070	.090	93	89	80	85	Calm.	N b W	N W b N	N 87 W	0.0	15.0	1.0	4.39	7.41	...	0.5
21	.999	.959	.825	.9238	5.3	28.4	30.9	23.57	— 0.17	.046	.105	.157	.112	82	66	90	79	Calm.	S E b S	S E b E	S 6 E	0.0	5.5	2.2	3.67	5.34	...	...
22	.771	.766	.793	.7817	39.6	42.8	38.9	40.07	+16.25	.210	.186	.194	.189	87	67	81	76	S W b S	S W b S	S W b S	S 39 W	19.0	10.0	13.5	6.99	8.77	...	...
23	.786	.598	.398	.5677	36.7	43.0	40.3	40.03	+16.10	.188	.174	.246	.204	86	62	98	82	N b E	E	S b W	S 37 E	6.0	3.0	2.0	1.84	4.56	0.600	...
24	.203	.310	.518	.3637	40.3	32.0	28.0	33.07	+ 8.93	.246	.158	.131	.171	98	87	86	88	S W	W	W	N 75 W	7.0	15.8	20 2	14 28	16.06	0.080	...
25	.836	.977	—	—	9.3	10.4	—	—	—	.058	.055	—	—	86	78	—	—	N W	W b N	W b N	N 68 W	25.0	25.0	5.2	13.69	14.06	...	...
26	30.318	30.272	30.128	30.2290	—0.8	14.3	15.8	10.43	—14.10	.040	.065	.065	.058	94	78	73	81	Calm.	S W b S	W b S	S 47 W	0.0	13.0	3.3	5.04	5.56	...	1.0
27	29.975	30.004	30.077	30.0223	19.4	32.7	22.3	24.98	+ 0.25	.087	.128	.094	.105	83	68	78	78	S S W	W b N	W	S 87 W	4.6	2.2	6.0	3.53	4.20	...	...
28	30.054	29.982	29.877	29.9605	28.7	30.9	32.0	30.48	+ 5.58	.130	.149	.157	.142	82	86	87	83	N b W	E b N	E b N	N 83 E	4.8	10.4	6.5	8.87	9.03	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.7183	29.6907	29.7066	29.7069	19.70	25.53	22.43	22.51	— 1.16	.104	.112	.112	.108	86	75	83	81	....	....	....	....	8.26	12.19	9.07	....	9.40	0.830	16.9

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR FEBRUARY, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer........................ 30.364 at 10 a.m. on 26th } Monthly range =
Lowest Barometer .... 29.126 at 4 p.m. on 14th } 1.238 inches.

Self-regist'ing Thermom.
Maximum Temperature..............................45°0 on } Monthly range =
Minimum Temperature..............................–8°0 on } 53°0
Mean maximum Temperature..............................33°61 } Mean daily range =
Mean minimum Temperature..............................18°12 } 15°49
Greatest daily range......38°1 from a.m. of 21st to a.m. of 22nd.
Least daily range .... 2°7 from a.m. to noon of 1st.

Warmest day.........22nd...Mean temperature..............40°07 } Difference = 37°49
Coldest day.........16th ...Mean temperature.............. 2°58 }

Maximum Radiation. { Solar..112°0 on 20th } Monthly range =
{ Terrestrial..–16°5 on 16th } 128°5

Aurora observed on 3 nights, viz:—12th, 16th, and 20th.
Possible to see Aurora on 11 nights; Impossible on 17 nights.
Snowing on 12 days; depth 16.9 inches; duration of fall 64.9 hours.
Raining on 3 days; depth 0.830 inches; duration of fall 20.0 hours.
Mean of cloudiness = 0.82.
Most cloudy hour observed, 2 p.m.; mean = 0.85; least cloudy hour observed, 10 p.m.; mean = 0.73.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1451.68	2049.91	621.45	4021.73

Resultant direction S. 80° W.; Resultant velocity 5.14 miles per hour.

Mean velocity..............................9.40 miles per hour.
Maximum velocity..........................30.0 miles, from 6 to 7 p.m. of 16th.

Most windy day.........16th............Mean velocity, 19.55 miles per hour. } Difference =
Least windy day.........10th............Mean velocity, 2.43 ditto } 17.12 miles.

Most windy hour ...... noon ....Mean velocity, 12.40 ditto } Difference =
Least windy hour...... 3 a.m ....Mean velocity, 6.86 ditto } 5.64 miles.

2nd. Midnight, Lunar Corona. 5th. Lunar Corona at 6 a.m.
12th. Solar halo during forenoon. 21st. Lunar halo, 9 p.m.
24th. Dense fog, a.m. 27th. Lunar halo, 9 p.m.

February, 1866, was comparatively cold, dry, and windy.

COMPARATIVE TABLE FOR FEBRUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	28.0	+ 5.0	49.1	— 8.3	57.4	8	1.475	6	...	...	...	....
1841	22.4	— 0.6	43.4	— 0.3	43.7	1	Inap	9	...	...	...	0.61 lbs.
1842	26.9	+ 3.9	48.7	2.5	46.2	8	3.625	9	...	...	...	1.03
1843	14.5	— 8.5	37.5	—10.2	47.7	1	0.475	21	14.4	...	...	1.05
1844	26.0	+ 3.0	47.1	— 0.4	47.5	4	0.430	7	10.0	...	...	0.43
1845	26.0	+ 3.0	46.6	— 3.9	50.5	5	Imp.	9	19.0	...	...	0.99
1846	20.4	— 2.6	41.4	—16.2	57.6	0	0.000	13	46.1	...	...	0.65
1847	21.5	— 1.5	42.2	— 1.0	43.2	2	0.550	13	27.3	...	...	0.69
1848	26.6	+ 3.6	46.9	— 0.6	47.5	4	0.775	8	10.8	N 65° W	2.53	5.69mls.
1849	19.5	— 3.5	41.1	— 9.2	50.3	2	0.240	13	19.2	N 41° W	1.48	6.58
1850	26.0	+ 3.0	49.2	1.3	47.9	7	1.235	9	23.1	N 80° W	3.43	7.61
1851	27.6	+ 4.6	50.2	1.3	48.9	7	2.600	4	2.4	N 64° W	1.99	6.94
1852	23.4	+ 0.4	41.2	— 3.2	44.4	3	0.650	11	13.0	S 75° W	3.34	6.42
1853	24.1	+ 1.1	43.4	— 0.6	44.0	4	1.030	15	12.6	N 49° E	2.51	7.30
1854	21.1	— 1.9	42.7	— 5.7	48.4	5	1.460	15	18.0	N 7° E	1.73	6.91
1855	15.4	— 7.6	37.3	—25.0	62.3	2	1 770	14	21.8	N 40° W	4.34	8.17
1856	15.7	— 7.3	35.3	—18.7	54.0	0	0.000	8	9.7	N 81° W	7.70	10.71
1857	28.5	+ 5.5	51.2	— 5.9	57.1	11	3.050	11	11.7	S 78° W	3.68	9.82
1858	17.0	— 6.0	40.9	— 6.6	47.5	1	Inap.	16	26.7	N 72° W	3.22	9.12
1859	26.0	+ 3.0	43.3	3.9	39.4	6	0.455	14	8.3	N 54° W	2.72	8.50
1860	22.8	— 0.2	48.1	— 8.4	56.5	7	1.330	13	18.8	N 61° W	3.28	8.73
1861	26.1	+ 3.1	44.6	—20.4	65.0	4	0.815	17	29.7	N 77° W	3.86	10.58
1862	22.5	— 0.5	35.6	— 3.7	39.3	3	0.180	17	23.1	N 55° W	3.93	8.52
1863	22.4	— 0.6	38.9	—19.8	58.7	7	1.450	12	22.0	N 23° W	2.29	10.13
1864	24.3	+ 1.3	43.9	—13.0	56.9	2	0.397	4	9.5	S 84° W	6.48	10.11
1865	22.4	— 0.6	41.0	— 7.0	48.0	5	0.810	11	16.8	N 23° W	3.95	8.23
1866	22.5	— 0.5	45.0	— 8.0	53.0	3	0.830	12	16.9	S 80° W	5.14	9.40
Results to 1864.	22.99	...	43.59	—6.88	50.48	4.2	1.000	11.9	18.05	N 70° W	3.15	8.34
Excess for 1866.	— 0.49	...	+ 1.41	—1.12	+ 2.52	— 1.2	— 0.170	+ 0.1	— 1.15	....	...	+ 1.06

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO CANADA WEST,—MARCH, 1866.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 PM.	10 P.M.	Re-sul't.	ME'N		
				°	°	°	°	°												°							
29.793	29.715	29.735	29.7482	33.4	38.9	37.1	36.93	+11.72	.178	.185	.192	.188	93	78	86	86	NE b E	N E b E	N E b E	N 60 E	3.5	2.6	4.2	2.47	2.47	0.005	...
.734	.682	.571	.6542	35.3	41.0	38.5	28.18	+12.77	.189	.210	.208	.203	92	81	89	88	Calm.	N E b E	E N E	N 61 E	0.0	4.4	9.0	4.33	5.17	0.055	...
.638	.588	.664	.6318	37.1	44.3	27.0	35.63	+ 9.92	.182	.134	.115	.140	83	45	77	68	W b S	S W b W	N N W	S 78 W	6.3	19.6	10.5	7.91	11.76	...	inap.
.628	.700	—	—	26.2	19.7	—	—	—	.124	.064	—	—	87	61	—	—	S W b W	W N W	W N W	N 71 W	13.7	26.8	20.1	20.00	21.06	...	inap.
.823	.783	.835	.8197	17.9	29.5	23.0	23.33	— 2.87	.085	.071	.077	.076	87	43	63	63	W b N	W N W	W b N	N 71 W	16.7	30.8	19.4	20.97	21.16	...	...
.911	.850	.793	.8440	16.1	29.8	24.1	23.70	— 2.80	.081	.096	.114	.091	90	58	88	73	W b N	W b N	W	N 76 W	5.0	21.2	8.6	14.55	14.65	...	...
.713	.680	.739	.7163	18.3	22.3	18.3	19.32	— 7.50	.079	.053	.079	068	80	44	80	66	W b N	W N W	W N W	N 64 W	10.6	23.6	18.2	22.98	23.16	...	...
.787	.769	.823	.7932	18.7	28.4	20.8	22.03	— 5.20	.082	.070	.065	.075	81	45	56	64	NW b W	NW b N	W b N	N 52 W	20.2	19.5	10.0	12.45	13.10	...	inap.
.722	.678	.864	.7633	18.6	22.3	16.1	19.12	— 8.40	.083	.066	.074	.075	82	56	83	74	N b W	NW b N	W N W	N 49 W	7.5	21.0	11.6	11.39	11.90	...	0.4
.957	.903	.761	.8638	10.0	27.7	23.7	21.85	— 5.97	.060	.092	.098	.086	87	60	77	73	W N W	S W b S	W S W	S 47 W	3.6	11.8	0.5	5.89	9.30	...	3.0
.421	.315	—	—	28.4	36.3	—	—	—	.142	.203	—	—	90	94	—	—	S b E	S W b S	N	S 56 W	9.8	8.5	10.1	3.96	8.47	0.030	1.5
.593	.697	.838	.7225	33.4	33.8	33.4	33.67	+ 5.12	.178	.158	.171	.171	93	81	89	88	N	N N E	Calm.	N 20 E	3.8	5.8	0.0	3.74	3.94	...	inap.
.906	.912	30.031	.9493	30.2	36.0	33.4	33.15	+ 4.18	.141	.153	.171	.158	84	73	89	84	N b E	N E b N	E b N	N 55 E	8.3	8.0	8.2	7.52	8.63	0.330	inap.
.752	.708	29.741	.7358	33.4	35.8	35.6	34.97	+ 5.65	.187	.204	.202	.196	98	97	97	97	E	E	NW b W	N 17 E	15.0	1.7	5.5	1.98	5.21	0.635	...
.753	.594	.480	.5913	34.5	35.6	33.8	34.38	+ 4.67	.192	.193	.182	.185	96	93	93	93	N N W	N E	E b N	N 35 E	6.2	4.2	2.6	0.62	5.26	0.320	...
.362	.266	.286	.3035	33.4	35.8	27.0	31.25	+ 1.22	.187	.143	.115	.140	98	66	77	77	S W b S	S W b W	W	S 77 W	12.2	14.0	19.0	15.89	16.74	...	0.1
.438	.581	.761	.6082	11.8	11.4	10.4	10.72	—19.73	.058	.043	.037	.047	77	59	53	66	W b N	W b N	W b N	N 82 W	21.5	31.8	16.8	20.41	20.58	...	...
.752	.429	—	—	8.2	21.9	—	—	—	.057	.084	—	—	91	71	—	—	W b S	S W b S	NW b W	S 78 W	3.5	19.5	9.3	10.09	12.24	...	0.3
.677	.675	.751	.7013	15.0	25.2	19.4	19.93	—11.33	.075	.073	.065	.068	86	53	60	62	NW b W	S S W	N	N 19 W	6.1	4.0	6.8	3.81	6.28	...	...
.781	.599	.304	.5508	15.8	21.5	25.2	20.72	—10.95	.054	.088	.122	.089	59	77	90	77	N E	E N E	E N E	N 66 E	4.6	18.2	18.5	14.98	15.29	0.500	0.2
.070	.353	.655	.3943	26.2	25.9	20.8	23.17	— 8.92	.124	.113	.090	.103	87	81	81	83	N E b N	W N W	W b S	N 75 W	6.2	20.0	3.2	8.20	9.27	...	...
.806	.843	.754	.8008	19.7	32.4	30.6	28.22	— 4.27	.096	.131	.123	.116	91	71	72	75	Calm.	S W	S b W	S 9 W	0.0	4.8	4.0	2.45	7.31	...	...
.539	.380	.479	.4660	31.6	36.0	32.4	32.92	+ 0.13	.140	.189	.153	.159	78	89	83	84	E	E	NW b W	N 56 W	15.0	0.3	20.0	5.07	10.54	...	0.4
.555	.477	.298	.4387	28.8	33.8	29.5	30.38	— 2.78	.144	.158	.136	.140	90	81	83	82	W b N	S S W	S W b S	S 86 W	12.2	11.0	8.0	12.28	14.32	...	0.3
.430	.494	—	—	11.8	13.2	—	—	—	.052	.041	—	—	69	51	—	—	W	W b N	W N W	N 73 W	23.2	26.0	24.7	22.57	25.18	...	inap.
.745	.835	.951	.8563	12.5	25.3	19.7	19.33	—14.65	.062	.065	.077	.069	80	47	72	67	N W	NW b W	W b N	N 57 W	19.0	20.0	4.8	11.21	11.49	...	...
30.043	30.066	30.050	30.0593	12.9	32.4	25.5	25.03	— 9.38	.069	.101	.111	.097	89	54	81	73	W N W	NW b N	Calm.	S 75 W	0.8	4.5	0.0	1.46	2.47	...	...
29.920	29.635	29.407	29.6303	26.6	31.6	34.2	31.33	— 3.38	.126	.148	.187	.154	87	83	94	86	S E b S	E b N	S	S 57 E	2.0	11.6	4.2	5.61	9.65	0.030	0.6
.386	.467	.614	.4978	32.7	34.9	29.5	31.47	— 3.63	.172	.131	.136	.141	92	65	83	80	S W	W N W	W b N	N 76 W	13.4	21.5	12.5	12.64	13.57	...	0.2
.629	.554	—	—	20.5	34.5	—	—	—	.093	.149	—	—	87	57	—	—	W b N	W S W	S W	S 64 W	8.6	8.5	4.3	6.92	8.46	...	0.1
.290	.057	.242	.1917	32.4	36.3	37.4	35.60	— 0.32	.161	.203	.170	.177	87	94	76	84	S S E	S E	W b S	S 61 W	8.6	5.0	10.5	4.79	8.20	0.010	0.1
29.6805	29.6470	29.6703	29.6666	24.47	31.07	27.17	27.55	— 2.83	.123	.126	.126	.124	86	68	80	77	....	....	....	....	9.26	13.88	9.84	......	11.51	1.915	7.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH, 1866.

Nots.—The monthly means do not include Sunday observations. The daily means, excepting those at relate to the wind, are derived from six observations daily, namely, at 6 A.M., 8 A.M., 2 P.M., 4 P.M., P.M., and midnight. The means and resultants for the wind are from hourly observations.

ighest Barometer . . . . 30.089 at 8 a.m. on 27th. } Monthly range=
owest Barometer . . . . 29.043 at 4 p.m. on 31st. } 1.046 inches.

ing Ther.
Maximum temperature . . . 45°.8 on 3rd. } Monthly range=
Minimum temperature . . . 7°.5 on 18th. } 38°3
Mean maximum temperature . . 33°00 } Mean daily range=11°35
Mean minimum temperature . . 21°65 }
Greatest daily range . . . . 21°6 from a.m. to p.m. of 10th.
Least daily range . . . . 2°2 from a.m. to p.m. of 17th.

armest day . . . . 2nd...Mean Temperature . . . 38°18 } Difference=27°.46
ldest day . . . . . 17th...Mean Temperature . . . 10°72 }

aximum { Solar . . . . 90°5 on 31st } Monthly range=
adiation { Terrestrial . . . . 2°0 on 18th } 92°.5

urora observed on 8 nights, viz.:—on 5th, 6th, 7th, 9th, 10th, 16th, 17th, and 18th.
ossible to see Aurora on 14 nights; impossible on 17 nights.
owing on 18 days; depth 7.2 inches; duration of fall 62.5 hours.
aining on 8 days; depth 1.915 inches; duration of fall, 35.7 hours.
ean of cloudiness=0.65; Most cloudy hour observed, 6 a.m; mean=0.75; least cloudy hour observed, 10 p.m.; mean=0.56.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2568.54	1061.28	1134.64	5995.89

esultant direction, N. 73° W.; Resultant Velocity, 6.84 miles per hour.
ean velocity 11.51 miles per hour.
aximum velocity 35.0 miles, from 11.30 to 12.30 p.m. on 24th.
ost windy day 25th—Mean velocity 25.18 miles per hour. } Difference 22.71.
east windy day 27th—Mean velocity 2.47 miles per hour. }
ost windy hour, 1 p.m.—Mean velocity, 13.94 miles per hour. } Difference
east windy hour, 6 a.m.—Mean velocity, 9.29 miles per hour. } 4.65 miles.

14th. Fog a.m. 15th. Dense fog at midnight. 17th. Very stormy cold day.
19th. Solar halo. 20th. First thunder storm of season.
22nd. Solar halo, Lunar halo at 8 p.m. 25th. Very stormy day; Lunar halo at night.
28th. Solar halo a.m. 30th. Solar halo during afternoon.

March, 1866, was cold, windy and and wet.
4th. Blue birds numerous.

COMPARATIVE TABLE FOR MARCH.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant.		Mean Force or Velocity
										Direction.	Velocity.	
1840	33.3	+ 3.4	56.9	8.7	48.2	8	1.640	8	...	...	...	...
1841	27.7	— 2.2	53.5	— 6.9	60.4	5	1.170	7	...	...	...	0.51 lbs
1842	35.8	+ 5.9	68.7	14.9	53.8	4	3.150	8	...	..	...	0.70 "
1843	21.3	— 8.6	38.6	— 2.8	41.4	2	0.625	18	25.7	...	...	1.18 "
1844	31.3	+ 1.4	50.3	9 6	40.7	8	2.470	8	14 0	...	...	0.57 "
1845	35.4	+ 5.5	61.7	9.9	51.8	5	inapp.	8	2.8	...	...	0.66 "
1846	33.1	+ 3.2	49.3	7.6	41.7	9	1.965	5	2.3	...	...	0.30 "
1847	26.2	— 3.7	44.3	4.8	39.5	5	0.850	6	4.2	...	...	0.71 "
1848	28.6	— 1.3	58.9	0.9	58.0	5	1.220	6	9.7	N 66 W	2.03	5.80 ms
1849	33.5	+ 3 6	53.4	15.4	38.0	7	1.525	2	2.3	N 3 W	1.48	5.37 "
1850	29.8	— 0.1	46.0	6.0	40.0	2	0.745	7	11.2	N 52 W	2.62	7.62 "
1851	32.4	+ 2.5	58.7	13.1	45.6	3	0.770	9	8.8	N 21 W	1.93	7.65 "
1852	27.7	— 2.2	44.8	— 3.2	48.0	8	3.080	12	19.5	N 8 W	0.71	5.81 "
1853	30.6	+ 0.7	56.3	— 0.1	56.4	6	1.080	8	7.1	N 58 W	2.60	5.96 "
1854	30.7	+ 0.8	52.8	10.4	42.4	9	2.425	3	2.8	N 53 W	3.39	8.03 "
1855	28.5	— 1.4	48.6	— 2.9	51.5	5	1.485	11	18.1	N 88 W	4.76	9.95 "
1856	23.1	— 6.8	39.3	—13.6	52.9	0	0.000	12	16.2	N 71 W	7.69	11.39 "
1857	27.8	— 2.1	56.5	— 3.9	60.4	4	0.335	15	11.3	N 63 W	6.63	10.84 "
1858	28.4	— 1.5	54.1	— 5.5	59.6	10	0.917	6	0 2	N 58 W	5.45	8.56 "
1859	36.3	+ 6.4	53.7	10.4	43 3	15	4.054	8	1.0	N 64 W	1.96	10.39 "
1860	34.5	+ 4.6	66.4	14.2	52.2	5	0.882	11	2.4	N 64 W	7.61	12.41 "
1861	26.9	— 3.0	43.2	— 4.1	47.3	8	2.125	14	7.1	N 54 W	4.33	10.56 "
1862	28.8	— 1.1	41.4	9.3	32.1	8	2.560	11	18.5	N 12 W	2.50	9.38 "
1863	25.8	— 4.1	41.4	— 3.4	44.8	4	0.687	17	11.4	N 27 W	2.62	9.27 "
1864	29.1	— 0.8	45.7	3.5	42.2	9	1.620	12	3.7	N 53 W	2.29	8.41 "
1865	33 6	+ 3.2	54.4	— 0.1	54.5	10	3.050	12	18.9	N 61 W	2.16	8.80 "
1866	27.6	— 2.3	44.3	8.2	36.1	8	1.915	18	7.2	N 73 W	6.84	11.51 "
Results to 1864.	29.86	...	51.38	3.69	47.69	6.2	1.557	9.3	9.10	N 57 W	3.35	8.67
Exc. for 1866.	—2.31	...	—7.08	—4.51	-11.59	+ 1.8	+ 0.358	— 8.7	— 1.9	...	...	+2.84

0.23

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THE

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THE CANADIAN JOURNAL

NEW SERIES.

No. LXIII.—JULY, 1866.

GRALLATORES: WADERS OR STILTED BIRDS.

BY THE REV. W. HINCKS, F.L.S., ETC.,

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The group of birds to which our attention is now directed has always been distinguished by naturalists and has been as little uncertain as to its limits as almost any leading division. It was marked out by Belon in the first attempt at a natural ornithological system produced in 1555, and has in some form been retained by all his successors. In truth, the birds of prey, the game and poultry birds, the waders, and the swimmers with the perching birds have almost always been recognized as orders, and the only question respecting the climbers has been whether they constituted a distinct order or ought to be accounted a suborder of perching birds. Other leading divisions occasionally proposed by writers of eminence are either founded on somewhat insulated families, or are artificially defined and founded on intermediate forms which there is no real difficulty in reducing under one or other of the orders above enumerated. One of the systems most copious in its divisions is that of the celebrated Temminck who gives no less than 16 orders of birds, but no less than half of these are but divisions of perching birds, three of these containing each one family. Of the remainder, three which have a strong natural affinity have been frequently included under the common name of Gallinaceous birds, (game and poultry), and of three more one is but a family of swimming birds and another is an intermediate group between swimmers and waders, containing some forms belonging to each, and combined by an altogether artificial character. Thus we get back without difficulty to the six great orders indicated above, and all the differences among systematists will be explained and removed if we only avoid confusing families with orders, and take such pains in ascribing to the orders their true distinctions as not to admit transition groups founded on inferior and merely artificial characters. We must, however, in receiving the six orders of birds, observe the peculiar position which one of them occupies in respect to the others. The perching birds (Insessores) are more numerous than all the other orders of birds taken together; they present to us the true type of bird-life from which the other orders are deviations, and their suborders or great sections are quite as well distinguished as the other orders and present such remarkable analogies with them that we seem, on the whole, to have two circles exhibiting different degrees of development, but having corresponding divisions of about equal importance. It may be convenient at present to count Insessores as one order and its secondary groups as suborders, but whether we consider the value of the distinctions or the number of species included it will be found to be really the case that whilst we collect under the name Insessores or perching birds, five orders well distinguished by external characters and modes of life, each of these is represented by one of the other five orders of birds which display more exaggerated forms of the same general structure. In adopting, therefore, six orders of birds we really receive ten arranged in two series the members of which analogically correspond one with another, each having its proper place necessarily resulting from the characteristic by which it is distinguished.

Now as to the series in which the orders of birds may be most naturally placed, all seem agreed that the rapacious birds (Raptores) should stand first, to which I cannot entirely assent, as I deem it necessary to keep the Perchers separate from all the others, and though it signifies little whether they stand first or last, if the latter position were chosen we ought in consistency to begin with the lowest forms ascending to the higher, in which case the Swimmers (Natatores) would be first, whilst if we adhere to the commonly adopted descending order, the Insessores must be first as the truest and highest expression of the Bird-type. To the modern practise of making the Insessores or *Passeres*, as they are often called, follow the Raptores, interrupting the series of the more deviative forms of birds, there are very strong objections, and I cannot see how it can be supposed to be natural. Dr. George Gray's plan of making the Goat-suckers follow the owls may seem plausible because each family being the lowest in its own series, the one among Raptores, the other in the Insessorial suborder Fissirostres, and both being night-flying birds, with the kind of plumage belonging to that character, there is a certain analogy between them, and the same might be as justly said if the Hawks had been placed last amongst Raptores, and the Dentirostral Insessores had followed. Such relations of analogy may be found in abundance and are very interesting, but they should not be allowed to turn us from that true series in which groups of the same degree are placed in the order of the faculties and natural characteristics specially developed in each. I have on other occasions endeavored to show what this true series is, and to trace it out in particular cases, at present I only compare with it the methods most deserving of notice, so far as to establish the proper position of the order of birds which I would on this occasion specially examine. Belon's series was, after the Raptores, the Waders, then the Swimmers, and then the remaining birds in a great miscellaneous assemblage. Had he discriminated the Climbers and the Game and Poultry from the Insessores, and introduced them between Raptores and Grallatores he would have excelled any series since proposed. Willughby did not approach the merit of Belon who had preceded him by more than a hundred years, and though his work is still valuable to the student of ornithology, his method requires no notice. Linnæus had six orders, which, if we sent back many members of his Picae, which is an arbitrary unmeaning collection, to Passeres (Insessores of the best later authorities) and made the remaining Picae represent Scansores, would give what I take to be the true list of orders, but the series is decidedly unnatural, as he makes Anseres (Natatores, Swimming birds), the 3rd order, followed by Grallae (Grallatores), then Gallinae (Rasores, Game and Poultry). Had he made this latter exchange places with the Swimmers his series would have been a good one though we might wish to place Insessores first instead of last. Latham improved in some respects the Linnaean series, placing the Waders in their proper relations, but he multiplied orders unnecessarily from six to nine, and inserted the Passeres (Insessores) next to Picae, which he retained in the Linnaean sense, an arrangement totally inadmissible. The great Cuvier adopted the six true orders, only leaving Insessores in the second instead of the first place, and to him we owe the suborders of Insessores, excepting that later writers generally, and I believe justly, reject his Syndactyli, for which I have substituted Serratirostres, occupying the second position. Since Cuvier's time the Waders have always retained their position immediately before the Swimmers. They appear to represent the suctorial or extractive form of nutrition, with a figure elongated in the beak and limbs, and with the habit of frequenting chiefly marshes and sea-shores. I shall next endeavour to determine the proper limits of the Grallatores.

From its striking external characters it is an order the true members of which would pretty readily find their place, but these same characters, attracting attention wherever they occur, might easily cause families representing the Grallatorial tendency but really belonging to other parts of the system to be hastily placed in this order, and it is not without considerable care that we can keep it free from such intrusions. I shall enumerate the principal instances in which an error of this kind has been committed in order to illustrate the principles upon which our judgment must be formed in such cases.

The secretary bird (Gypo geranus) is a bird of prey, remarkable for the length of its legs, and possessing in the spur on its wing another character which may be accounted Grallatorial. It is probable that this genus itself constitutes a family and represents the Grallatorial tendency among Raptores, being thus next in affinity to the Vultures, amongst which it has often been placed, and which constitute the Rasorial family in the same order. It is not unnatural that when first made known it should have been mistaken for a Wader, but with our present knowledge of its structure and mode of life, there is no difficulty in referring it to the order Raptores. Cuvier placed the Ostrich and its allies, forming the family Struthionidae, amongst the Waders, notwithstanding the important external and anatomical characters which connect these birds with the Rasores; and it appears as if hesitation as to which characters should be deemed most important had led others to the compromise of elevating the family to the rank of a separate order placed between Rasores and Grallatores. I have considered this subject in a former paper, in which I have shown that the family Struthionidae represents the Grallatores in the order Rasores, and I have endeavoured to bring together the subfamilies, several of which had been allowed to remain in very unsuitable places. Among these was Psophinae, the Trumpeter birds, representing the Rasores in the family, but which even Dr. George Gray regards as a subfamily of Ardeidae. Cuvier likewise retained among the Grallatores the Flamingo (Phaenicopterus), whose long legs undoubtedly give it the aspect of a wader, so that one might plausibly maintain that it is the representative of the Natatores among Grallatores were it not that the Duck-like beak and the internal structure corresponding with the Duck family, prove that it is really but a long-legged form of Anatidae representing in that great family the Grallatorian type. Dr. G. Gray has rightly perceived its family connection, but has placed it first among the subfamilies of Anatidae, in order to meet the last of the Grallatores. I must, nevertheless, presume to think that its relation to the Grallatores is strictly one of analogy and implying no immediate affinity should not affect its position. Dr. Gray makes the Rallidae (the Rail and Water hen family) as the last of the Grallatores join the Anatidae which he makes the first family of Natatores. The real connection I should maintain to be that the Rallidae represent the Rasorial tendency among Grallatores, the Anatidae among Natatores, each being the third family in its order, whilst Phaenicopterinae is the Grallatorial subfamily amongst Anatidae, and the coots which Dr. Gray places immediately before it, form the Natatorial representative among the subfamilies of Rallidae. This is a striking example of the way in which those analogies which so beautifully bind together the order of Nature may mislead us if we confound them with direct affinities. I cannot venture on this criticism which I submit to the judgment of the reflecting and candid reader, without, at the same time, bearing my humble testimony to the great value of Dr. Gray's work which displays not only the great knowledge which his position and resources might lead us to expect but an amount of skill and judgment rarely equalled, and which have materially contributed to advance the attractive branch of science to which he has devoted himself. His great work has for some years been my frequent companion in the museum and the study, and I gratefully acknowledge both the pleasure and the assistance which I have derived from it. I will now attempt a statement of the families and subfamilies of Grallatorial or Wading birds, in reference to their mutual relations and natural series. According to the theory of classification which I have on several occasions endeavoured to establish by various evidence, we expect to find first a family exhibiting the greatest power and the highest general development consistent with the Grallatorial type; secondly, one specially marked by active power, or, which in this case is the same thing, approaching most nearly the form and characters of Insessorial birds; thirdly, one imitating in its habits the Rasorial birds; fourthly, one preeminently Grallatorial, showing in its figure and mode of taking food a special tendency to the character of this order; and last, one making an approach to the Natatorial mode of life, and having relations of structure and habits with the last division of birds whose life is properly aquatic. Where the families admit of subdivision we expect also that the subfamilies shall conform to the same general law, but where any family or subfamily represents a structural tendency strikingly at variance with the common type, we usually observe it to be very limited in extent, often confined to a single genus or even to one or two species. Of this latter principle there is a good illustration in one of the families of the order now under our consideration, if, at least, I am right in a view which finds much favour with me though I am not supported in it by authority. Dr. G. Gray makes the Phaleropes a subfamily of the Scolopacidae (Snipe family), placing it last among his six subfamilies, under the name Phaleropodinae. Considering the adaptation of these creatures for swimming and their seeming to snatch at their food whilst moving in the water, so as to have eminently aquatic habits though manifestly within the Grallatorial order, I am disposed without at all changing their position immediately following Scolopacidae to elevate them to the rank of a family and regard them as the Natatorial representative in the order, a change which is indicated by calling them Phaleropidae. It is true that there are but three species in Gray's work, and they must be altogether very few, but this might serve as an objection to their being accounted a subfamily as much as a family. The number of forms found in a genus, subfamily, family, order or class is widely variable. We use those names to express our idea of the comparative importance of the characters or our perception of the relation of the particular form to others.

There will scarcely be a doubt that Ardeidae (Cranes, Herons, &c.)

occupy the first position among the families of Grallatores. Charadriadae (Plovers), will stand second. Rallidae (Rails, water hens and Coots) come next. Scolopacidae (Snipes), follow, and Phaleropidae, as already explained, seem to me to complete the series, nor am I acquainted with any Grallatorial birds which do not fall within one or other of these families. I shall offer a few remarks on each of them in their order, endeavouring to determine the sub-families, and noticing what is most deserving of attention in respect to their habits and mutual relations as far as the necessary limits of this article will permit.

It is very difficult to give precise and clear definitions of groups of animals or plants, even when we plainly perceive the natural relationship, probably because there are various points of resemblance, some one of which fails in one example, another in another, leaving us none which holds in every member of the groups, though considering the whole structure, there are sufficient reasons for placing each in this position rather than any other. The consequence is, that we are obliged to distinguish each natural assemblage by all its well marked characters, and we must not be too rigid in expecting exact conformity to all of them in every individual case, though we must find a preponderance of the characteristics of the group, and expect to be able to assist our judgment by other relations between the particular object and known members of the group. This is the difficulty which interferes with the good working of our systematic tables, and which making extended knowledge and experience often requisite for ascertaining the objects of natural science, is apt to discourage beginners from a pursuit in other respects most interesting and delightful. We have probably at length reached a just view of the limits of the Order Grallatores the Wading birds, and can now see how certain characters ought to have prevented mistakes which prevailed for a time; but the fact that Cuvier was led by their long necks and legs to place the Ostrich and its allies, the Bustards, and even the Flamingo among the Waders, whilst lessening our discouragement at our own difficulties, will show what various considerations carefully weighed, and studied under every possible light, gradually lead even men of the most extensive knowledge and the greatest genius to the perception of truths, which when once established meet with ready acceptance, and only excite wonder at their ever having been doubted. Perhaps the difficulty of distinct definition in natural science is no where more felt than in the class Birds. I must, however, endeavour from the best authorities to characterize in the first place the five families of the waders already enumerated and placed in what I regard as their natural order. First come Ardeidae, the Herons, birds of the greatest size and power which this order affords and exceeded in this respect by very few in the whole class. They often feed on fish and small Amphibians or Reptiles, or even Mammals. These they snatch with their long and usually strong beaks out of water, or in marshy spots. The whole order tends to elongation of the beak, neck, legs and wings, the lower part of the femur as well as the tibia being naked, and the food being sucked up, extracted or snatched in a manner highly characteristic. *The Ardeidae have the bill longer than the head, thick, strong, usually compressed, rarely expanded, and more or less depressed. Feet tetradactylous, with the toes joined at the base or semi-palmate.* This character is often rendered more vague by the awkward necessity for including in it the Trumpeter, (Psophia) and the Caraima forming a small sub-family, which I am strongly persuaded that we ought to refer to the family among the Gallinaceous birds (Rasores), which represents the Grallatores. Without them the character applies to a considerable number of birds varying a good deal amongst themselves, and in their differences so clearly exhibiting the prevailing tendencies in analogy with the Orders, and the families under each, that they may properly constitute sub-families.

First we place Ciconinae the Storks, which have straight conical pointed bills, stout legs and feet, the membrane connecting the front toes very manifest, the hallux, or hind toe raised so as only to touch the ground, the covering of the legs and feet reticulated seales. They are known from the next subfamily by their greater size and strength and by a peculiar habit or port, more easily recognised than defined constituting the popular distinction between Storks and Herons. The genera of this subfamily admitted by Dr. G. Gray, and characterised chiefly by the peculiar shape and comparative size of the beak, are Dromas, Ciconia, Leptoptilus, Mycteria and Anastomus. These birds belong to India and Africa, a few visiting Europe in their migrations, and one being known in South America, but no example occuring in North America.

The next subfamily Ardeinae, embraces the Herons, night Herons, and Egrets, with which are commonly placed the Spoonbills, Boatbills, and Balaeniceps, but considering the importance of the form of the bill as expressing habits and the frequent connection of its width and depression with the natatorial type, it seems better to treat these genera as a separate sub family, the fifth in the series, and the genus Platalea, the Spoonbills, which may give it a name, connects well with Ibis which would thus stand near to it.

The Herons are widely diffused and several among them are familiar to us as natives of our Country. They are though often large, lighter birds with a longer and more flexible neck than the Storks, and remarkable for the long loose plumes of their crest necks and wing coverts, which, notwithstanding what may seem to us some disproportion in the parts of the body make many of them remarkably beautiful birds. The long slender toes with the hallux usually lengthened, and almost or entirely on the same plane with the other toes show the arboreal habits which characterise most of the species, and which justify the position in which I have placed them. Gray admits the genera Europyga, Ardea, Tigrisoma, Botarurus and Scopas, besides those which I refer to the subfamily Plataleinae. In Canada we have four or perhaps even five species. The certain ones are Ardea Herodias, A. exilis, Botaurus lentiginosus and Nycticorax naevius, if Ardea virescens occurs within our borders it offers a fifth example.

The next subfamily Gruinae, Cranes, consists of birds with shorter and more arched beaks, the hallux only touching the ground, shorter and stouter toes, with the nostrils, guarded behind by a membrane placed near the middle, in a deep groove which is not produced to the tips; the tertiary feathers of the wings long and drooping, and in some instances the birds having large crests, ear-tufts, or caruncles. Their characteristics show them to represent the Rasores in this family. There are three Genera, Grus, Anthropoides and Balearica easily distinguished by their beaks. I have here substituted Viellot's name for the second genus, for Scops given by Moehring much earlier and adopted by Gray, because that word being an ancient name for an owl is sometimes applied to a genus of that family and is too near to Scopus a genus of the preceding sub family. In such cases the law of priority must be sacrificed in order to avoid confusion. We have at least one Canadian species of Grus, G. Americana Linn. G. Canadensis is usually considered as a synonyme, but in a paper in this Journal (Vol IV. 266) Mr. Cottle, of Woodstock, a very high authority on such a subject, offers reasons for believing that there are really two species, and until some further evidence is produced, the question must be considered as doubtful. The Cranes are followed by the Ibises (Tantalinae) whose narrow elongated and arched beak strikingly expressive of a suctorial mode of feeding at once refers them to the fourth position among the divisions of the family, the character of the subfamily is taken from the form of the beak, approaching the Limosinae. The tip of the bill is obtuse, the nostrils are linear and naked in a groove, the Hallux is long enough to be spread upon the ground, and strong. There are three Genera, Tantalus, Ibis and Geronticus, together containing under 30 species. North America can illustrate the genus Ibis, but none of these birds occur so far north as Canada.

There remains the subfamily Plataleinae to complete our sketch of the Ardeidae. The swelled or expanded, sometimes depressed beak, supplies the character and being a frequent accompaniment of the Natatorial or Fissirostral type is here assumed as marking the fifth or lowest subfamily. The known generic forms are three: Platalea the Spoonbill, of which there is a species in the Southern United States, as well as a well known European one and several others, Balaeniceps an extraordinary bird from the interior of Africa, and Cancroma found in South America. They are all Strange Anomalous forms, well distinguished generically, but kept together by the much expanded bill.

The second of the great families of Grallatores is Charadridæ, Plovers, and the very reason, it is probable, which induces other zoologists to place it first or last in the order, according as their series is descending or ascending, is what influences me to assign to it the second place—namely, that the peculiarities of the order are less strikingly impressed upon it, and it makes a certain approach towards the ordinary character of bird-life. Hence it is the expression of that peculiarity which belongs to birds in the whole vertebrate series, to the Insessores or Perchers as compared with the more deviative orders, and in each of those orders to the family which is least marked by the special characteristics. In an attempt to form a series this would of course lead to their being made the joining points with the higher birds. When we reject any general series, and express our sense of relation by analogous positions, it leads to an arrangement of the families in each order, which shows the one nearest to birds in general, always occupying the second position, whilst that which displays the highest development consistent with the type has the first assigned to it. Charadridae have the bill of moderate length seldom longer than the head, with the basal portion of the culmen usually depressed and weak, the apical part strong and swollen; the nostrils in a deep groove: Feet elongate with rather short toes, more or less connected at the base by membrane; hallux resting on the point only or none.

The sub-families seem to be, 1st, Oedicneminae, Thick-knees and Oyster-catchers, with the longest and strongest bills, and with their stout legs covered with reticulated scales, the hallux entirely wanting.

2. Chionidinae, Sheath-bills, placed by some Zoologists among rasorial birds, but seemingly belonging to this group, remarkable for the short, strong, somewhat arched bill, compressed at the sides and its basal portion enclosed in a bony sheath concealing the nostrils. The gonys is angulated, the tarsi short and stout, the hallux present, but elevated so that only its tip touches the ground, the front toes with the connecting membrane well developed.

3. Charadrinae, Plovers, with the bill somewhat long and slender vaulted at the tip with the sides grooved and compressed, the hallux either absent or very small and elevated so as scarcely to touch the ground.

4th. Cursorinae, Coursers with the slender bill slightly arched towards the tip, the nostrils placed in a subtriangular membranous groove, the legs very long, scutellated before and behind, the hallux absent.

5th. Cinclinae, Turnstones and Pratincoles have the bill rather short and straight, generally vaulted towards the apex, the wings long and pointed, the tail rather short, sometimes forked, the hallux present, slender, touching the ground.

Dr. Gray makes six subfamilies of Charadridae though Chionidinae are excluded, being referred by him to Rasores. The combinations here proposed seem to me natural, but I am much in doubt as to the true order of the subfamilies, the best characters for determining the analogical tendencies appearing to me to be in this case unusually mixed.

Our Canadian examples of the family belong chiefly to Charadrinae. They are Squatarola Helvetica, the black-bellied plover, Charadrius vociferus, the Kildeer plover, Charadrius semipalmatus, the ring plover, Charadrius Virginicus, the American Golden plover. Oedicneminae may be represented by Haematopus palliatus, the American oyster catcher, as Cinclinae is by Cinclus melanocephalos the Am. Turnstone. The third Grallatorial family, manifestly representing the Rasores or Gallinaceous birds, is Rallidae the Rails and whilst its place in the order is certain and easily determined there is no family of birds which more beautifully illustrates in its subfamilies the plan of classification which I adopt. We have the Screamers (Palamedeinae) with their size, strength, and peculiar armature, giving the idea of power, the Rails, Rallinae, active and lively, approaching most nearly to the figure and appearance of Insessorial birds, the Water hens (Gallinulinae) whose popular name expresses the universal appreciation of their analogy with Rasores in a more special sense than the rest of the family, the Jacanas (Parrinae) with their long legs. enormous toes, and singular bill, peculiarly Grallatorial, and the Coots (Fulicinae) strongly resembling the Water hens, but their much shorter legs, and toes connected at the base and lobated at their sides, plainly showing the Natatorial tendency. The general character of the family may be thus expressed: *Feet tetradactylous, with elongate toes, the hallux being generally large and extended on the ground. Tarsi generally with transverse scutellae anteriorly. Wings moderate or short, usually rounded. Breast compressed with a narrow sternum.*

Palamedeinae are peculiar to tropical South America. Parrinae, inhabit warm climates where they walk on floating leaves in search of their food, their very long toes supporting them by extending the surface on which they press, much on the principle of our snow shoes. Rails, Water-hens and Coots are widely distributed, especially in more temperate and cooler regions, and supply the examples of the family found among our Canadian birds. There are four species of the subfamily Rallinae, Rallus Virginianus, R. crepitans, R. elegans, and Ortygometra Carolina; one of the subfamily Gallinulinae, Gallinula galeata; and one of Fulicinae, Fulica Americana Gmel.

We now come to the fourth family, Scolopacidae, the Snipes, which among Grallatorial birds most especially display the semiaquatic habits and the suctorial or extractive mode of securing food which are characteristic of the type, they are, therefore, properly placed in that position among the Grallatorial families, which indicates the representation of this particular structural tendency. They may be defined as follows: *bill mostly elongate, slender, soft; nostrils basal longitudinal, covered by a membrane in a groove of the bill; wings long, pointed, the first feather generally longest; toes long, slender, hallux short, much elevated, touching the ground, sometimes wanting.*

Dr G. Gray makes six subfamilies of these birds, but he includes among them Phaleropodinae, which, on account of their peculiar feet and specially aquatic habits, I think better regarded as the fifth or Natatorial family in the order. The remaining five subfamilies are probably best placed in the following order: 1. Totaninae, Long-shanks; 2. Tringinae, Sandpipers; 3. Scolopacinae, Snipes and Woodcocks; 4. Limosinae, god-wits; 5. Recurvirostrinae Avocets. In the first of these subfamilies there are five species of Totanus and two of Tringoides, belonging to North America and very possibly to be found in Canada. Of the Sandpipers (Tringinae) thirteen species belonging to four genera are North American, of which probably not less than ten are found in Canada. Of the Snipes and Woodcocks (Scolopacinae) six North American species are enumerated by Gray, ranking in three genera. I have good authority for three of these being Canadian. Of Limosinae three species of Numenius and two of Limosa are North American, of which several certainly occur in Canada; one of each genus is in Mr. McIlwraith's Hamilton list. The small subfamily of Recurvirostrinae gives us one Recurvirostra, the American Avocet, and one Himantopus.

I need add nothing to what I have already said of the family Phaleropodidae, which, though very small, seems the true natatorial representative among Grallatores, and one of the natural links between the two orders. All the three species of Phaleropus recognised by Gray are North American, and one of them is often seen in Canada.

The purpose of this paper was to determine the true limits of the Grallatorial Order, and the proper series and mutual relations of its families and sub-families. I will not, however, conclude without a few words on its characters, especially those which, whilst only occasionally met with, seem to be always connected with this kind of structure, and therefore, whether occurring in true Grallatores or in Grallatorial representatives, in other orders or families, will, in doubtful cases, assist the observer, by furnishing pleasing indications of analogies, which are real, but not obvious to every eye. No Grallatorial character is more striking and universal than elongation of the bill, neck and legs; it is indeed one of the commonest marks of the representation of this structure in other orders and families, so that where the principle of the existence of a certain set of tendencies repeating themselves under each distinct type, and thus producing relations of analogy among forms otherwise remote, is not well understood, confusion always arises between the true members of a group and its representatives or analogues in other groups. It was thus that Gypogeranus, the Struthionidae and Phœnicopterus have come to be ranked among Grallatores, being really the representatives of this order each in its own group. It will occur to every one that it is not only among birds that the Suctorial or lower nutritive type is marked by elongation of the body, and especially of the head, neck or snout. Where this elongation existing in any considerable degree is joined with semi-aquatic habits, the food being extracted from water or mud, no doubt remains as to the genuineness of the grallatorial character. An occasional but very remarkable characteristic of this particular tendency in birds, is the pencilled tongue for sucking in the juices of flowers. I do not know of this occurring in any true Wader, but it is found in several families representing the lower nutritive type, and as far as I have observed in no other case. Thus the Ramphastidae probably constitute the family representing this position among Scansores, and have a feathered tongue. The same, or some similar anomalous development of the tongue is found in the sub-family of Parrots, which takes the same place in its own series, and it is again remarked in Meliphagidae the family of Tenuirostres which most specially exhibits the suctorial character of the Order.

It is difficult to explain the use of the bend of the bill in Recurvirostrinae, and from the situation of that sub-family a question might be raised, whether the peculiarity is grallatorial or natatorial, but it occurs again in two species of Humming birds belonging to the specially tenuirostral sub-family, and Swainson brings into comparison with Avocetta the gliriform quadruped Nasua, the recurved snout of the latter exhibiting an almost ludicrous resemblance to the former which is the more important, because the Glires are the Tenuirostres of quadrupeds, and the analogy suggested is in every way proved to be a real one.

Another character apparently connected with the suctorial type, but the connection of which with its other characteristics is quite inexplicable, is the spur on the wing, this is found in several Charadridae and Rallidae, and elsewhere always in Grallatorial representatives in other orders and families, with no exception that occurs to my recollection, excepting the form of Geese, called by some Zoologists Plectrophorinae. I had concluded from various reasons, that this is not a true sub-family of the great and important family Anatidae. I believe these sub-families to be, Fuligulinae, marine ducks; Anatinae, fresh water ducks; Anserinae, geese and swans; Phaenicopterinae, Flamingoes; and Merginae, Goosanders. Some of these however, are large and have striking structural variations that would admit of further representative subdivision, and if any thing of this kind were attempted in the case of Anserinae, the long beak and toes, as well as the spurs, would without question place Plectrophoreae in the fourth position representing the Grallatores. A probable order might be 1 Cygneae, 2nd, Bernicleae, 3rd, Ansereae, 4th, Plectrophoreae, 5th, Nettapeae. It may thus appear probable that even in this instance the spurs on the wing are connected with a grallatorial position, and should always point our attention in that direction. Its occurrence in the grallatorial representative among Raptorial birds, and the use said to be made of it as a weapon of offence, are very interesting facts, but further observations are required. There are certainly many instances in which peculiarities of structure, which are at first judged to belong to a species are found to prevail in small groups occurring in different parts of a general system, all which, however important their differences, have a mutual relation of which this peculiarity is one of the signs, and to the intelligent naturalist often a very valuable indication.

I need hardly say, in conclusion, that in the order Insessores, which is equivalent in extent and importance to the whole five other orders of birds, the Suborder Tenuirostres represents the order Grallatores, displaying throughout all its families the same arrangements for the suctorial or extractive method of obtaining food under modifications, which again distinctly represent the five Suborders of Insessores, and consequently also the five orders of other birds. If we look further and inquire after the corresponding groups in other parts of the animal kingdom many interesting relations are brought under our notice, of which I shall refer to a very few. Among the Gyrencephalous Mammals, a great division, whose separation from the lower mammalia seems to me strikingly natural, we have the Carnivora manifesting power and ferocity; the Qudrumana activity and arboreal habits; the Ruminantia are the analogues of Rasorial or Gallinaceous birds; the Pachydermata, a truly natural assemblage detected by the sagacity of Cuvier, and the attempts to divide which otherwise than into the families composing it, has only obscured the subject, represent the Grallatores, as the Cetacea obviously do the Natatores. The protruded and highly sensitive snout, used for discriminating the food in the ground or amidst dirt, and the semiaquatic habits, some actually frequenting water, others delighting in wet mire, show the general tendency in its application to the higher mammalian structure. Among the Lissencephala the claviculated Rodentia are in many respects like Pachydermata on a small scale, and correspond with them much as the Tenuirostral birds do with the Grallatores, nor is there much difficulty in finding the analogous group among the Lyencephala, the lowest great division of Mammals. We may also note that as Ruminantia correspond with Rasorial birds so the family Struthionidae, among the latter, corresponds with Camelidae among the former, this real analogy in position and relations justifying the the popular comparison of the Ostrich with the Camel. If again we look to the highest order of Gyrencephala the Carnivora, whilst the first place is given to the Felidae, and the Ursidae may probably claim the second. The social habits and tendency to carrion feeding seem to fix the Canidae in the third position, corresponding with Vulturidae among Raptorial birds, the blood-sucking, long and flexible-bodied Mustelidae, which only admit secondary divisions according to the structure of their feet, certainly represent in this order the lower nutritive type, like the Grallatorial birds—and thus lead us on to the Natatorial seals. The worm-like figure of the Ophidians among Reptilia and their correspondent groups among Amphibia, repeated in the Eel-like forms of fishes, remind us that these animals in their several classes represent the great class Annulata in the Articulate subkingdom, whilst it may probably appear that each class of this subkingdom has a specially suctorial order. I might point to the flies in a higher, the Bugs in a lower series of Insecta, and very strikingly to the Icthyopthira among the primary divisions of Crustacea. The same thing might be illustrated in the Molluscous and Radiate subkingdoms, but that I am wandering too far from my immediate subject, and I have recently pointed out the special suctorial type even among the Protozoa. It is by considerations such as have now engaged us, as it appears to me, that we rise above the elementary and technical in Natural Science to the perception of infinitely varied relations, opening to us a magnificent general system. Our insulated observations are connected and harmonised, order and beauty open more and more to our delighted view, and whilst recognising every where unity of plan and perfection of design, the raptured thought rises from the wonders of creation to the adoring contemplation of the God of Nature, infinite in power, Supreme in Wisdom and Benevolence.

ON THE ABORTIVE TREATMENT OF CHOLERA, AND THE SPECIAL TREATMENT OF ITS SEVERAL STAGES.

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At the present time when the great pestilence, *par excellence* of modern times may be daily expected among us, the ports of Halifax and New York having been already visited by it; the subject of cholera in any point of view must possess great interest to all intelligent minds, but to Medical men who may be called upon to use their best endeavours to withstand the inroads of this great destroyer, the subject of treatment must be especially interesting.

Those of us who have in former epidemics been placed in positions of direct contact with cholera, have felt how impotent were our efforts in many cases to save the victim or relieve the sufferer, and the conviction that not unfrequently mistakes and want of preparation on the part of both physician and patient may have led to the loss of valuable lives, induces me to bring the subject before the Section, that the discussion I hope to provoke may assist us in forming an opinion as to the rational treatment of cholera.

The literature of the subject is "*vast and perplexing*." The most varied and contradictory opinions have been formed as to the nature of cholera, and still more numerous and conflicting are the modes of treatment recommended. But the great bulk of evidence thus brought before us is surely capable of being sifted, and if we can separate some grain from the chaff a little good will be done.

I assume that cholera depends upon a poison, communicated in many instances from man to man, by contagion, it may be frequently, or more generally, by what are called epidemic influences, but it is foreign to the object of this paper to advocate the views of either the contagionists or the non-contagionists. I only allude to the theoretical, that I may better approach the practical. Taking it for granted that the poison of cholera, like that of other zymotic diseases when received into the human system under circumstances favourable to its developement, goes on to reproduce itself, and become capable of affecting other similarly placed bodies, and so on *ad infinitum;* I would argue that like other diseases of its class it has a period of incubation more or less prolonged; a period in which, after the reception of the poison, into a system more or less suitable for its developement, catalytic changes are progressing; changes which will, unless arrested, end in confirmed cholera, whilst yet the more usually recognized features of the disease are in complete abeyance.

It is well known that a premonitory stage is very generally recognized, and is spoken of as the stage of *cholerine*, of *choleraic diarrhœa* or the premonitory diarrhœa. The writer believes that in temperate climes, and in the European race this stage of cholerine is very generally present, though not constantly so is very certain; yet among the Asiatic races it is perhaps more frequently absent, and in the latter it is common for a victim to fall down suddenly with the collapse of cholera, the premonitory stages having passed by without notice.

In our own country we frequently find that a premonitory stage has passed by unnoticed by the patient, or if feelings of illness or *malaise* have been present, their connection with cholera has been repudiated. This is especially manifest when there is no diarrhœa present, nor any uneasiness referrible to the abdomen. Under such circumstances even intelligent people deny that there is anything wrong with them, although, on careful examination, it may be found that the tone of the system is manifestly lowered. The poison is working, though not yet very manifest.

I would then divide the period between the reception of the poison and its developement into what may be called the stage of *invasion*, (i. e. the stage preceeding collapse) into two grades, the first of incubation, and the second of premonition, the latter being a condition usually recognized at any rate by the physician, but the former usually being overlooked. Nevertheless its existence may frequently be detected, and as it may proceed to the period of *invasion*, without the occurrence of usual premonitory diarrhœa, attention to the symptoms that may denote it, is of great importance. An acute observer in the East Indies observes that:—

"The premonitory stage of Asiatic cholera is characterized by a very peculiar appearance of the person about to be affected. The countenance is said to wear the expression seen immediately before the accession of the cold stage of intermittent fever, but I think it is more like that of a person who has some vague, undefined, central impression of the bowels being about to move. He seems involuntarily to wish to be quiet, though he has no sick feeling, and does not complain.

"When cholera is known to be at hand, there cannot be an excuse for neglecting to attend to this peculiar warning, and not discerning its significance."

"The powers of life appear, indeed, often to be almost annihilated immediately after this premonitory stage, and sometimes even before the state has had time to be fairly developed, and deafness and weakness of the voice may be remarked even from the first appearance of perturbation in the countenance."

Dr. Poznanski, in a communication to the Academy of Sciences, in 1857, makes the following propositions:—

"1. That, during the prevalence of cholera, it frequently happens that the pulse is extremely low, and reduced to 45, or even 42, in persons apparently in perfect health.

"2. That this symptom is unaccompanied by any other denoting a morbid state.

"3. That, when the pulse is low, the blood becomes dark and viscous; while, in persons whose pulse is in a normal state during the epidemic, the blood is perfectly healthy.

"4. The cholera only attacks those that have previously experienced a diminution in their pulse.

"5. That this diminution, which often occurs weeks before the regular attack, may be considered a pathognomonic symptom of the approach of cholera.

"6. That those who have experienced the diminution in question had always escaped the disease whenever they have followed a regimen calculated to accelerate the circulation.

"7. That the falling-off of the pulse and, therefore, the predisposition to the disease, are, in general, proportional to the want of energy in the circulation of the blood, and to the excess of atmospheric pressure.

"8. That this diminution of the pulse does not occur in healthy subjects, when the epidemic has ceased."

In reference to these propositions, it may be observed that, if the 3rd one is true, it cannot be correct to say that a diminution of the pulse is "unaccompanied by any other symptom denoting a morbid state," for the blood changes here noticed must necessarily be attended by other phenomena, which, though probably not obvious to a superficial observer, would be discoverable to careful enquiry.

Cases of confirmed cholera have been known to occur in which there were pre-existing debility, languor, lassitude, and general malaise, without any positive sickness, or any diarrhœa, or other symptom referrible to the bowels.

The attention of the writer is the more drawn to Dr. Poznanski's propositions, in respect to the state of the pulse in incipient cholera, from a case witnessed within the last three years. A patient who was seen almost daily by the writer, had occasion to visit some family relatives, at a considerable distance from his home, during hot weather, and whilst they were suffering from a malignant form of an eruptive fever. The gentleman in question found the air of the house so unpleasant that he rose in the night and spent the remainder of it in the open air. Returning home, he felt so exceedingly weak that he had to maintain the recumbent position for many days, without any obvious symptoms more than a pulse depressed to 36 or 40, a tendency to syncope on getting up, and an eruption of about six spots of a measles character on the chest. Under the use of brandy, quinine, and animal broths, he slowly convalesced. Some of the family he had been visiting had died after about 24 hours illness of what was termed malignant measles. The patient whose case is now related had previously had measles in its usual form.

Dr. Bell, of Philadelphia, says of a patient in the first stage of cholera, that "His countenance is sharp and dark. He knows not of this symptom, and it is only recognizable to the eye of experience." Physicians have occasionally observed it in persons well-known to them, during the period preceding an attack, and have noticed, in connection with it, that the subjects were particularly irritable on being taxed with illness, and refused to submit to treatment. In many cases, a fatal result follows such obstinacy. A case was related to the writer, which occurred in this city, in the epidemic of 1849, where the patient had some undefinable feeling of illness, but without diarrhœa, for one day; on retiring to rest, at night, he took a glass of punch, and, falling asleep, was wakened, in the morning, by cramps drawing up his legs and flexing his thighs strongly on the abdomen. His voice was nearly lost, and collapse, with all its symptoms, was actually on him. With prompt treatment, he recovered, and is still living. A distinguished writer on cholera states that collapse has even come on before any evacuation by stool had taken place.

Very lately, M. DeWouves has published a memoir, in which he states that albuminuria is present, in the urine of patients, some days before cholera sets in: this symptom serving as a means of diagnosis between this disease and common diarrhœa. Observations on this subject ought to be carefully made and recorded.

Without going more minutely into details, it may be conceded that in cholera, as in other zymotic diseases, the period which, in the latter, is called the stage of incubation, may present phenomena varying in different persons, races, climates, and epidemics.

Believing that much more can be done in cholera, in the way of early and abortive treatment, than is generally attained, the writer would suggest that, where any condition of things is recognized, during the approach or actual existence of the epidemic, as may be indicated by perturbation of countenance; some headache; ringing of ears; dulness of hearing; slight giddiness; weakness of voice; diminution of pulse, or any similar derangement or indication of the lessening of vital power, with or without the diarrhœa or nausea so usually present, that an attack of cholera be apprehended, unless other causes of disturbance can be distinctly recognized. This consideration is much enforced by the circumstance that, in many places, an outbreak of cholera displaces other diseases than those allied to itself; so that *any indisposition may be the precursor of, and be merged in, the prevailing epidemic.*

So far as these premonitory symptoms only are concerned, we are not justified in pronouncing any individual case, one of cholera, and before its outbreak, and even during its prevalence, many may be inclined to doubt the actual connection in every case between the causes of confirmed cholera and the cases of minor indisposition that are so prevalent at the time, but it seems to the writer that as some premonition of an attack is so very generally present, it would be exceedingly unwise to relax in vigilance, but on the contrary it becomes a duty to endeavour by every means in our power to preserve the community, or such portion of it as may be in our charge, unharmed from the visitation. Some have contended that the diarrhœa that so frequently precedes actual cholera, is neither part nor parcel of disease; for that where it subsides, cholera may set in; that where it continues or recurs, cholera does not necessarily follow; and, consequently, it is unphilosophical to regard the one as the forerunner of the other.

It is desirable to set at rest as many of the points of dispute in reference to this question as we can, so soon as observation and experience give us the necessary data. If every practitioner would keep a record of his cases and tabulate them, valuable information could be afforded on this and kindred subjects.

The attention of the profession in this city has been already directed to the subject of the means of prevention or prophylaxy, and the excellent memorandum of the Central Board of Health affords most valuable information and suggestions to physicians, and the public alike; yet a great deal more may be done by the timely counsels of Medical men to their patients and the circles in which they move, as the influence of each one is more manifest there than elsewhere. In this connection it may not be amiss to call to mind the urgent necessity for Medical men and nurses to maintain perfect cleanliness of hands, and person generally, having water and towels in readiness for use after visiting every sick room, and enforcing the propriety of domestics and others not handling food without washing the hands. Dr. Beck recommended that all provisions be carefully washed on being brought into the house, or else exposed to a temperature of 212°.

In reference to what is termed abortive treatment, it may be premised that efforts in this direction have often met with success. A notable instance of it occurred at Newcastle, on the outbreak of cholera there in 1853. The commanding and medical officers in charge of the garrison there, (comprising 14 officers, 391 men, 44 women and 70 children,) after consultation devised certain measures of a sanitary nature such as are universally recommended, but a special feature in their plan was to have the water closets watched by the non-commissioned officers, and whenever a man was discovered to visit them more than once a day he was placed under medical treatment.

In addition every man, woman, and child was inspected by a medical officer at least once, and in the case of those who lodged outside the barracks, in affected districts, twice a day. By this rigid system diarrhœa was discovered and treated without a single life being lost, the cases being more numerous than the whole strength of the force, while of the population surrounding, the deaths amounted to 1500.

For full details in this notable instance reference can be had to the Report of a Commission appointed to inquire into the circumstances connected with the outbreak and published by the Home Government.

In addressing Medical men on this subject it is scarcely necessary to do more than allude to the principles that should regulate the mode of procedure in treating abortively the incipient stages of cholera, as due reflection and study of the peculiarities of each class of cases will lead to proper medication and regimen. The office of the intelligent physician is surely not to be discharged by prescribing one routine of treatment for all cases in any one stage, however unlike the individual circumstances of each; yet of all the diseases that "flesh is heir to," of none have so many unreasoning plans of treatment been proposed and practised as is the case with respect to cholera.

An anonymous writer who had seen the disease in the East Indies, writing in 1848, recommended as useful in warding off an attack a combination of Quinine, 6 grs., Calomel, 4 grs., Opium, 2 grs., followed by a glass of brandy and hot water. This dose he had been in the habit of giving in all cases of early stages. But, it may be observed, supposing that these four remedies are the ones selected to fulfil recognized indications, one or more of which may be present in any given case, would it not be much better to prescribe those only which are really needed, and not to administer a mere nostrum.

While there is neither pain nor abdominal disturbance the opium can not be called for in full doses, and so with other remedies, which are only to be given when indications demand them.

Debility, diarrhœa, depressed circulation, disturbed sensation, require treatment when severally present, and the subject of any one of them ought to seek comparative quiet of mind and body as well as appropriate medication.

As it has been assumed that in incipient cholera a poison is present in the system, a poison of the zymotic or catalytic class, the question of endeavouring to eliminate it by emesis or by purgation has often been raised and a suitable treatment devised, while latterly it has been proposed to antagonise the catalytic action of the poison in the blood, by exhibiting remedies of a class having power in certain circumstances, of arresting catalytic action.

In the premonitory stage where diarrhœa is present, it is conceived that nature may be seeking an outlet for the poison, but as experience teaches us that such diarrhœa, if unchecked, will terminate in collapse, no one would allow it to proceed unrelieved.

Attempts to assist such natural efforts by purgatives have not resulted favourably, and remedies of that class, from Croton Oil, down, are rarely now proposed or used. Calomel, however, a purgative to some extent, but more, it may be asserted as an excitant of secretions often suspended, has numerous advocates. Of its powerlessness in collapse to produce any immediate effect there is reason to be convinced, and Dr. Headland's statements on this subject, in his work on the action of remedies in the system would seem to be conclusive. Yet in the early stages where the depurating organs are not acting sufficiently, mercury in some of its forms may be found useful. The stage of reaction may be modified by the active presence of mercury in the system, for the early appearance of urine and biliary stools is an exceedingly good augury.

The eliminative action of emetics is more generally approved of. Although emetic tartar has its advocates, its depressing effects are to be feared; and, therefore, the exhibition of milder evacuants is more to be recommended. Some writers speak favourably of ipecacuanha, in full doses; and, many more, of the domestic emetic of mustard, with or without the addition of table salt. Twenty-five grains of ipecacuanha, in powder, was the usual dose of Mr. Greenwood, and others; and their mode of treatment was found to be very successful. In cases where nausea is present, the action of a mild emetic would appear to fulfil a natural indication. After its operation, the patient should keep his bed, and be subject to carefully regulated diet, until reaction has passed over, and convalescence is fairly established.

In those cases of languor and debility, with few or none of the usual concomitants of the preliminary stage present, tonics and rest, with good digestible food, and all the usually recommended hygienic accessories, will be very desirable, as they would be at any season; but, in cholera times, it may be well to ascertain the value of medicines that may be called anticatalytics. Medicines of this class have the power of arresting fermentive changes in organic solutions; *par exemple*, that of vinous fermentation in the juices of fruits: hence it is concluded that they may be a vast benefit in diseases of a zymotic character. Such remedies are from inorganic sources, and include some of the salts of Iron and Manganese; several compounds of Chlorine, and of Sulphur in its lesser state of oxidation.

The Tincture of the Sesquichloride of Iron is, latterly, in extensive use in erysipelas; and is, certainly, in combination with Quinine, a very useful preparation. Its action seems to depend mainly on its power of modifying the blood crasis known to exist in that disease, and its efficacy in arresting the development of a crop of boils is known in the profession.

The same preparation has been used in cholera as long ago as 1848, but the object in prescribing it was with a view to its styptic effect: to retard the excessive secretion of approaching collapse.

Subsequently, the per-nitrate of iron (the persesquinitrate of Kerr) being introduced as a remedy in diarrhœa, was recommended, by some, in cholera, as likely to be useful. It does not appear that any other preparation than the tincture of the sesquichloride was ever used largely; but those who have used it extol it very highly. From its tonic and antiseptic powers, and its being easily obtained, it is likely to prove highly beneficial in those early stages of disease where an anticatalytic would be indicated. In cases where there is debility more or less marked, this remedy alone, or combined with Quinine, would appear entitled to favour.

Another remedy of the class of anticatalytics is the Hyposulphite of Soda. In Sarcina ventriculi, its efficacy in preventing the usual fermentive process is undoubted; and, by analogy, it might be used in the incipient stage of cholera; but it does not appear to have been introduced in this way. Although the alkaline permanganates, which are said to possess the power of antagonising organic poisons, have been recommended in cases of poisoning by Strychnia, Veratica, Hydrocyanic acid, and others of that class, it does not appear that they have been used in zymotic diseases, other than typhoid fever and scarlatina, and little is known of their effects, beneficial or otherwise.

The bisulphite of soda has been used, in medicine, as an anticatalytic, by Professor Polli, of Milan, and Dr. Mapother, Health Officer of Dublin; and Dr. DeRicci, of the latter city, relates four cases of catalytic diseases, as he prefers to call them, rather than zymotic, in which the Bisulphite appears to have accomplished what was expected of it by the original proposer, Prof. Polli. In a case of infection from an animal poison, DeRicci gave to a lady one scruple of the Bisulphite, in infusion of Quassia, with tincture of bitter orange-peel, and a little Battley's solution. This dose, repeated every hour at first, was given less frequently afterwards. In other cases—two of them being severe ones of measles—the same salt was depended on, and rapid recovery followed.

In incipient cholera, a recipe containing the Bisulphite in scruple doses, with a bitter tincture, and some opiate, where diarrhœa may exist, would, probably, be satisfactory treatment—especially in those cases where the individual cannot leave an infected district. Dr. De-

Ricci's article on this subject may be seen in Braithwaite's Retrospect, Part 50; and in Dublin Quarterly Journal for August, 1864.

Of chlorine preparations the hypochlorite of Soda (Labarraque's Solution) has been recommended but does not appear to have been much used internally. A watery solution of chlorine, the aqua chlorinii of the Edinburgh pharmacopœia was given by one practitioner in doses of one dram, with a little sulphate of soda in nearly one hundred cases of choleraic diarrhœa, with favourable results in all but two, who were in collapse before the remedy was applied.

In considering the abortive treatment of cholera, it is well to bear in mind that when the disease breaks out in any place people have an instinctive desire to escape fram the infected or tainted district, and in certain races of man, this amounts to an irresistible impulse. Thus during the late epidemic in Barcelona, 40,000 persons are said to have left that city. In many places where such an exodus has taken place, the panic and fatigue of travelling, with the abandonment of the comforts of home, and the accessible conveniences of a town or city have concurred in rendering such a stampede most disastrous. The panic-stricken take the taint with them, and fatigue and fright give it potency. Whilst we can recommend the quiet and orderly removal to safe localities of those whom neither duty calls nor narrow means compel to stay in their usual places of abode, it must not be forgotten that even physicians, nurses and others, brought close in contact with the dreaded pestilence, escape as well as others.

Unless the hygienic condition of a locality or house is not only bad, but at the time unimproveable, it need not be deserted or abandoned.

There are some individuals, however, whose removal from a cholera district is very desirable. Such are persons with disorder of the excretory organs; whose blood is not ordinarily depurated; those with disease of the mucous membrane of the intestine, or with liver or kidney disease.

Certain districts of country, elevated, naturally well drained, sparsely peopled, and possessing abundant and pure water supply, are well known to be healthy localities, and safe places of resort, although persons from a tainted district may remove thither, and die from the pestilence. But in such instances it is not usual for the disease to attack any but the specially predisposed, and the poison is soon lost where there is little to lend intensity to it.

But even in towns and cities there appear to be places that are comparatively safe, though statistics are wanting in regard to them. It has long been said that the atmosphere of tanneries is prophylactic against the disease, and the same is said of the vicinity of gas-works. In the latter case the evolution of carbolic acid in a gaseous form from the tarry products of the distillation of coal, may account for the immunity enjoyed, *carbolic acid being a very effectual disinfectant,* but in the former instance the reason is not apparent. Very recently, it is urged, by continental professors, that carbolic acid and its preparations are destructive to the cholera-poison, while chlorine compounds are not so, but are, nevertheless, useful in their place, from their power of removing offensive odours.

It may not be amiss to observe that, in the same vicinity, elevated spots are more safe than low ones, and upper apartments of the same house than the lower rooms. These considerations should have their influence in relation to the prophylaxy and treatment of the disease.

In the same connection it may be observed that when an outbreak occurs a "privy atmosphere" is especially noxious. Every thing that can be done to prevent and neutralize emanations from human *excreta,* both in-doors and out, should be attended to, and the ordering of the domestic use of safe disinfectants, by practitioners, in the houses of their patients, whether disease be present or not, is a great means to this end.

In houses where the disease exists every excretion, and all soiled clothes, should be at once disposed of; the former be received into vessels containing some disinfectant and then buried, and the latter at once soused in water containing some carbolic acid or its preparations, or some permanganate of potass, as in the cholera disinfectant made in this city, or its kindred preparation, Condy's red fluid.

The latrines used by the healthy must not be contaminated by the discharges from the sick, and the nurses and attendants must be fully instructed as to the proper modes of disposing of all excreta and soiled clothing.

In approaching the subject of the treatment of the more decided stages of cholera, I shall adopt the usual mode, and speak of them as the *period* of invasion or *confirmed cholera, the blue or cold stage,* or *stage of collapse,* and the stage of *reaction* or *consumptive fever.*

The *stage of invasion* usually occurs in the night or early morning, its more usual symptoms are well known, nausea, vomiting, emptying of the intestinal tube, indescribable faintness or sinking, peculiar rise, watery-stools following the more fœcal excretion, cramps of voluntary muscles, chiefly of the clonic or permanent rind, pulse at first small, weak and accelerated, becoming rapidly less perceptible, and finally lost in the extremities, while there is yet strong pulsation of the cœliac axis and abdominal aorta, coldness of the surface supervenes, the bronzed flush of countenance and skin giving place to it, and a clammy cold sweat, often very profuse, is every where present. This state of things, if not speedily arrested, ushers in the stage of collapse.

Collapse may come on without any evacuation by the stool taking place, though sometimes in such cases, the intestinal tube is filled with the secretions peculiar to cholera. Cramps of voluntary muscles may likewise not occur, and it is considered a sign of peculiar malignancy when either of these is absent. During the cold stage the voice is changed, the lips, the nails and skin become blue or livid, the surface collapsed, the skin corrugated and sodden in appearance, and insensible to the action of chemical agents; the patient cold to the touch and pulseless, yet complaining of heat; demanding cold drinks and rejecting them by vomiting, or at any rate not absorbing the liquid by the stomach, and assuming a strikingly cadaverous aspect. No symptom is so invariably present to the full extent as sinking of the circulation, and no morbid post mortem phenomenon more constant than the alteration of the blood in colour and consistence; the darkness and thickness being extreme, and observable in direct ratio with the duration of the disease and the quantity of gastro-intestinal discharge. When death occurs in this stage, the venous system, the right side of the heart and the pulmonary artery with its branches are found loaded with dark thick blood, while the lungs are comparatively bloodless, and the systemic arteries quite empty. This would indicate that either from inspissation of the blood, from spasm of the pulmonary arterial vessels, or from both these causes combined, the blood does not reach the air-cells to get rid of its carbon and absorb the due amount of oxygen. In natives of India where collapse often happens, without intestinal discharges taking place, the blood is found to be dark likewise.

The experiments of Dr. John Davy and others, have demonstrated that the respired air of cholera patients, contains a much smaller proportion of carbon than is sufficient for the proper purification of the blood; respiration is apparently going on well, it is the vital changes that are not performed, the exchange of carbonic acid gas for oxygen not being effected. Viewing this fact in the light of the discovery that ozone, the more active form of oxygen, is absent from the atmosphere in cholera times, we may ask if in any degree, and how far these facts are related, and whether especially they stand as cause and effect. At any rate it may be useful to set on foot some plan for the developement of ozone in cholera sheds, and in the rooms of patients threatened with the severe stages of the disease. It has often been advanced that the want of oxygen in the blood is the cause of cholera, but if this be not conceded, we must acknowledge that, the effect of such want must be to exaggerate vital depression. The *secretion of bile and urine, both of which require oxygen for their formation,* is arrested in collapse, and their reappearance is a proof of oxidization being re-established, and is consequently a most favourable sign in the following stage.

As fever follows the cold stage of ague, where life is not lost already, so the blue stage of cholera is followed by one of *reaction* or *consecutive fever,* ushered in usually by returning warmth and circulation, injected conjunctivæ, restlessness, and symptoms more or less severe of cerebro-meningeal congestion or inflammation. Yet some cases are more insidiously fatal in this stage, the patient settling down into a sleepy state, which while apparently refreshing and salutary, ends in coma, or death.

The modes of death in cholera are not uniformly identical. When it occurs with little or no gastro intestinal discharge, and before the reactive stage has come on it is probably due chiefly to spasm of the pulmonary artierial system, actively preventing the process of blood aeration. This form, a malignant one, should be met by chloroform, inhalation to the point of relaxing the spasm, but not carried so far as to prevent the inhalation of sufficient air to effect the necessary blood changes.

Where the blood has become highly inspissated from loss of serum, and this thickening of the vital fluid is considered to be the cause of the obstruction, any means that will even partially restore its wonted fluidity, is certainly indicated. In this way, the free exhibition of liquids by the mouth, while grateful to the patient may prove very useful.

The patient's demand for cold water is very great, and it is cruel to deny it. If vomiting is severe, small lumps of ice given frequently, and swallowed, may be better than copious drinks for allaying it, but if ice is not at hand the patient should have cold water freely allowed him when confirmed cholera has supervened; for irrespective of the comfort given, the power of absorption by the veins of the stomach, may not be altogether lost.

Stevens' treatment consisted in giving previous to and during collapse, large quantities of water with saline ingredients to replace those lost in the dejections. The injection of liquids into the veins to replace directly the lost serum has been often adopted, and has sometimes appeared successful. Some writers urge that its usefulness depends on the degree of heat of the injected liquid, and its consequent power of relaxing the spasm of the pulmonary circulation, and there appears some ground for the opinion, although it may be equally due to the replacing of some of the lost watery parts of the blood.

Dr. George Johnson argues in favonr of the former view, and it does appear that if the inspissation of the blood were the sole cause of the obstruction, restoration from collapse should be almost impossible, except where venous injection is performed.

Various liquids have been injected; the blood of healthy subjects, the milk of cows, the sp. gr. of which is about that of serum, and more frequently solutions at a blood heat, containing salts to replace those supposed to have been lost in the evacuations.

It has been proposed, by Dr. Johnson, to use the liquids at the temperature of from 106° to 120° F., under the impression that the heat itself will relieve the obstructive spasm of the minute pulmonary arteries.

The exhaustion consequent upon excessive discharges must be considered an element in the production of death, and should be steadily met as the exhaustion is manifested. Stimulants are indicated, and especially those of an antispasmodic class: as chloroform with brandy, in small quantities, with a little opium in some soluble form, so as to be available at once. Turpentine and creosote have been highly recommended, in the stage of *invasion*, to arrest discharge, and are worthy of extended trial. Astringents: Acetate of lead, in scruple doses, with opium, was Dr. Graves' favourite; and large injections of dilute solutions of Catechu have been used in the East. There can be no doubt that any means of checking excessive serous hœmorrhage, and of rousing the system, is most desirable, if it can be accomplished by remedies that cause no difficulty when reaction comes on. It is at this latter stage that the mischief resulting from the previous administration of free doses of opium and brandy is made manifest.

But, for the purpose of rousing the system from collapse, the most powerful means appears to be *cold affusion.* The shock of cold water upon the head and upper part of the body has a most decided effect in restoring a patient from collapse. It should be repeated many times in quick succession, if found beneficial, until a sufficient effect is produced, whilst, at the same time, the rest of the body and extremities must be kept moderately warm. In hot weather, in India, it was not found necessary to use warmth, but friction only, to the limbs.

The application of ice to the spine would seem to be a remedy of the same character, though the theory of Dr. Chapman, that cholera depends upon hyperamia of the spinal cord and its membranes, would give a different explanation to its utility. It has long been known that there is congestion found in the meninges after death; but this may be an effect of the deficient exhalation of carbon, and of the retarded circulation, and not the cause. If the application of ice to the spine has the effect of rousing a patient from collapse, it has the advantage of not disturbing him so much as the cold affusion, and may prove a better remedy in the consecutive fever.

The management of the stage of reaction must be conducted on general principles. It is the testimony of all writers, that those who have taken the least brandy or opium, previously, have the best chance of surviving this stage. On this question, I may refer to the treatment at Guy's Hospital, as it appears in the "Lancet" for August, 1849.

A mode of death, then, that may occur in this stage, is from congestion, caused by uræmia, to a great extent; and, as the action of alcohol and opium is, undoubtedly, to retard the secretion of oxydised products: bile, urine, &c., it may be seen how their free administration, when collapse is at hand, produces increased difficulty afterwards. Still, the judicious use of these powerful remedies, in the early stages, may be justified—especially with regard to small doses of a soluble form of opium—one that is immediately available. It is asserted by many that where, in such stages, a stimulant is needed, that a few minims of chloroform, in a suitable vehicle, repeated every ten minutes to an hour apart, form a better remedy of this class than ordinary alcoholic liquors. In reaction, urea is formed in the blood with great rapidity. The want of circulation, during collapse, has retained those matters which go to form it, in the tissues; but, when circulation is re-established, uræmic poisoning is soon perceived, unless the kidneys resume their function, and a tolerably free secretion from them takes place. The amount of urea present in the blood, in reaction, often amounts to 2 per 1000. In this connection, it will be seen how death follows, in cholera, upon a patient with diseased kidneys—a result so uniform that some have considered the condition of those organs, after death, the result of cholera, when it may be rather inferred that their condition prevented his recovery by occluding the outlets through which, only, urœa could be eliminated. Hence the drowsiness, coma, convulsions, it may be, and death. In less highly marked cases, remedies may be found in the use of diuretics and cholagogues—especially such of the former as are believed to have the power of expelling urea from the system.

The length of this paper precludes any further remarks on other remedies; but this will be unnecessary even to the junior members of the profession, who have no personal experience of cholera, if the plan of treatment instituted be rational, and in accordance with the indications of each case.

MARRIAGE AND INFANTICIDE IN CHINA IN THEIR RELATIONS TO POPULATION.

BY W. HENRY CUMMING, M.D.

It is neither possible, at the present time, nor necessary, on the present occasion, to determine the population of China. Whether the proper number be one hundred and fifty millions or four hundred millions, we need not now enquire. For the purposes of this paper it is only necessary to state that in many localities the people are so numerous that they are scarcely able to obtain a meagre subsistence. They "swarm" in every direction. In rich plains the villages are frequent and the cities populous. On the sea-coast, where the soil seems unable to support such multitudes, the ocean yields great quantities of food. Fishing-vessels are to be seen along the whole coast. Thousands are driven, by a storm, into a single port.

In these densely crowded regions, the mass of the people are extremely poor. They live in miserable houses; they wear very little clothing; they are scantily fed. At Amoy the ordinary daily wages of common labourers cannot exceed five cents. Sixteen labourers could readily be obtained for one dollar a day. Carpenters, joiners, masons, blacksmiths, and tailors earn only about one eighth of a dollar daily. In a country where rice costs two cents a pound; beef, five cents; and pork, seven, it is evident that the wages of mechanics can procure only very poor food. And, when it is remembered that, among the common people, house rent, and fuel, and food, and clothing, for wife and children, are to be procured, it is plain that the pressure is very great. It is, indeed, wonderful how life can be maintained in such circumstances.

One result of this extreme poverty is that the natural development of children is very slow and tardy. A rich man's son, at sixteen years of age, is evidently verging on manhood. The voice has changed, the larynx is enlarged, the shoulders are broad, the neck is thick, the full height is reached, the beard is appearing. It is not at all uncommon for the sons of the rich to be married before the age of eighteen.

Among the poor, on the other hand, at the same age, the stature is that of a child, and none of the signs of manhood have appeared. The voice is often unchanged at twenty, and the whole frame childlike.

It is thus evident that among the Chinese the experiment has been made shewing the minimum of food consistent with life and health. Many are unable to obtain even this, and use food unfitted to their wants and tending to induce disease. Putrid fish are often eaten. Salted vegetables constitute a large part of the food of the very poor. Hence permanent dyspepsia with all its serious consequences.

Such being the condition of the poor, we might naturally suppose that marriage would be confined to those in easy circumstances, and that the redundancy of population would thus, in a few years, disappear.

But in China marriage offers the only provision for old age. It is the "Savings' Bank" of the people. Sons are expected to support their aged parents. Every man, therefore, desires to marry, that he may have three or four sons to maintain him when he is old. But, in order to marry, money is needed. A wife costs eighty dollars, and a man, whose daily wages are five cents, will find it a tedious business to accumulate so large a sum. Even a mechanic, earning from ten to fifteen cents a day, must wait several years before this amount can be secured. A man who can save ten or twelve dollars a year will, in seven years, be able to buy a wife. It is worthy of note that, in Western Asia, 3,500 years ago, Jacob gave seven years service for a wife. It must not be forgotten that a large part of a young man's wages is often appropriated to the support of his parents, and that his "marriage-fund" grows very slowly. The hopelessness of his condition often leads to a relaxation of effort; and, looking forward to a desolate old age as the only issue of his exertions, he becomes disheartened and gives up the struggle.

Of course, when parents have the ability, they gladly purchase wives for their sons. Self-interest alone would induce them to do this, for they may hope thus to secure grandsons to support them in their old age, even if they should lose their sons. Just as, in France, a parent puts aside money to secure a son against the conscription, so, in China, does he strive to accumulate enough to purchase a wife for him at the earliest suitable age.

Another plan is often adopted, especially where there is only one son, and the parents feel doubtful of their ability to accumulate money enough to purchase a wife. A girl fully marriageable is worth eighty dollars, but a girl five years old is worth much less; and, indeed, may sometimes be obtained for nothing. A little girl is therefore obtained, and reared in the family, as a wife for the son. A difficulty about this arrangement is that the children learn to love each other as brother and sister, and feel no disposition toward a conjugal union. Where this happens, the girl is sold to another, and the proceeds of the sale are expended in the purchase of a wife for the son. Where, however, the marriage does take place between persons thus brought up together, it is esteemed very satisfactory. The parents have a daughter-in-law whom they have long loved as their own child, and thus a fruitful source of domestic trouble is eliminated.

After all the industry, economy, and contrivance to obtain a wife, the desired results do not invariably follow. In the first place, the wife may prove barren, and then the labour is all lost. In the next place, the wife may bear daughters, and no sons, and then the failure is equally complete; for daughters, when married, are lost to the family—having been, by the fact of marriage, entirely transferred.

But, thirdly, the sons may be born and reared, and yet fail to perform the duties devolved upon them. They may be indolent, stupid, inefficient, or even dissolute, drunken, and utterly worthless. All these possibilities make it the more important to multiply the chances of success by a larger number of sons. It is generally supposed that, with four or five, there is very little danger of suffering in old age.

Let us consider the case of a man who, having been long married, has no son; or, of him who, at the age of forty, is still too poor to buy a wife. If the married man is really attached to his wife, he may be unwilling to take a concubine; or, he may be too poor to buy one. In such cases recourse is had to adoption. Yet it would be cheaper to buy a wife than a large, well-grown boy. At Amoy the adopted boys are brought from the Northern provinces. There the general destitution seems to be far greater than in the South. Inundations often produce wide-spread desolation; famines are more frequent. Boys are often brought from Tien-Tsin to Amoy who have been purchased at very low prices, or have even been given away by their parents, because they could no longer feed them. These boys are sold to men who have no sons, and who desire to adopt them. The highest prices are given for the youngest boys. The reason of this is obvious. A boy removed, at the age of five or six years, from his home to a distant province, growing up among a strange people, talking a different language, utterly forgets his home and kindred and country. If kindly treated, he learns to love his adopted father as if he were his own. Whereas, a boy of ten or twelve will always remember his own home; his parents, and the scenes of his early life. Unless very affectionate and grateful, there is danger that he will fail to adopt his new father.

Having thus briefly shown that, notwithstanding the great difficulties in the way of obtaining a scanty support, the poor are most anxious to marry, a serious question presents itself. "How does it happen that the population of China does not increase to an extent altogether exceeding the power of the country to sustain it?" If the learned Malthus had been requested to give counsel to a nation in the condition of the Chinese, he would have been greatly puzzled. "Self-restraint," "prudence," "forethought," are his great preventives of a too rapid increase of population. But the case of the Chinese is without the range of his philosophy. It is not an overmastering passion which urges on the infatuated Chinaman to marriage. He is now, at 25 years of age, calmly looking forward to the distant future, and trying to make provision for it. He is all "prudence," "forethought," and "discretion." He has eighty dollars in hand; shall he marry? He is not in love—he never expects to be in love—but he is anxious to make such an investment of his eighty dollars as will produce the best results thirty or forty years hence. He is as cool as possible—willing to listen to reason, and to take good advice. In Europe he would be advised to deposit his money in a Savings' Bank, and add to it from time to time as he had opportunity, with the assurance that he would thus secure the means of comfortable subsistence in old age. But in China there is no safe investment for money, where it will be secured from official rapacity or private fraud. The only mode of securing himself from want in his later years, that he can devise, is to buy a wife and rear sons. The security is not perfect, but he knows no better plan. Who can show a mode of investment more likely to secure the desired end? And yet imagine the horror with which the professor at Haileybury regards this mad scheme. "To have three boys grow up you must have three girls also. You propose then to rear six children to adult age, and you are one of fifty millions of young men in the country. You expect then to add three hundred millions to an already redundant population. And the next generation; what will become of it? And what will become of the empire? How are you all to be fed? And yet what better can you do? You are right in providing against want in old age."

Suppose that while the matter was under consideration, and the case looking more and more hopeless, a clever physician should approach and whisper in the professor's ear to this effect: "Sir, I have a remedy for this difficulty. This man wishes to have three sons to work for him when he is old. Now, I have discovered a way by which the sexes may be produced at will. In having three sons he need not have three daughters, as you suppose. I will tell him how he may have three sons and only one daughter." The professor is delighted with this new plan. "This is just what we want. If you can manage to keep down the number of women, the work is done; there can be no redundant population. Let each family have only one daughter, and it can be succeeded by only one family through all generations."

Now, the Chinese have adopted a plan which secures to them the identical result proposed by this imaginary physician. They have not learned how to procreate the sexes at will. They cannot have three sons and only one daughter *born;* but they can have only one daughter *reared.* They have learned to destroy the girls at birth, and have thus secured the country against an excessively redundant population.

How long female infanticide has been practised in China is not known, and there are no means of ascertaining it. Chinese books say nothing on the subject.

The proportion of infants killed probably varies in different places according to the poverty of the people. The rich never kill their daughters—they rear them all; and, in their households, there are as many girls as boys. To the rich, daughters have a special value. By giving them in marriage to men of rank and official position, they may hope to secure their aid in defending their wealth from the rapacity of others.

In the poorest villages the number killed seems to vary from a half to two thirds. In reply to the question, "How many girls do you rear?" the answer usually is "three tenths," "four tenths," "five tenths." In examining the mothers as to the sex of the children in their arms, it usually appears that three fourths of the whole number are boys. In such cases it is evident that two thirds of the girls have been killed.

The first economical result of this destruction of female children is that to which reference has already been made: the too rapid increase of the population is most effectually hindered.

Its next result is that it confines marriage to the more active, industrious, and vigorous men. Only thirty or forty men in a hundred can marry; and these, for the most part, at the age of thirty. Industry, frugality, and perseverance are needed in order to marry. The feeble, the indolent, the dissolute will fail to obtain wives. The influence of this constant elimination of the inferior individuals from the class of fathers must be powerful upon the race. Health, strength, activity, and energy are the conditions of marriage; the offspring must be beneficially affected.

The inability of most men to obtain a second wife tends to make them not only industrious but careful of their wives. It is said that the prohibition of second marriages to the clergy of the Greek Church makes them model husbands; so, in China, does the pecuniary hindrance make husbands anxious to provide every comfort for their wives.

Divorce in China is exceedingly rare.

The scarcity of women is also a great discouragement to polygamy. Every woman may be married; and, in most cases, the condition of a wife is considered decidedly preferable to that of a concubine. The price of a concubine is, therefore, much higher than that of a wife.

Prostitution is necessarily checked by the great scarcity of women, all of whom may find husbands.

The condition of widows is also much modified by this disproportion of the sexes. In most Asiatic countries, widows are, to a great extent, outcasts; neglected by their relatives and abandoned by those who should protect them. In China, widows are in demand as wives, and remain unmarried only because they choose to do so.

It follows, of necessity, from this extensive destruction of female infants, that a vast number of men are unmarried. But, in such a country, so densely peopled, there is no remedy for this but emigration. Multitudes of Chinese leave their native land and settle in the islands of the Indian Archipelago. This process will doubtless continue until the Chinese shall have occupied these uncultivated regions so vast and fertile. If China shall ever enjoy a good government, the results will be on so large a scale as to excite the utmost interest of the political economist.

MARY BRADLEY, THE DEAF AND BLIND MUTE.

Attention was called in a recent number to some features of special interest connected with the case of Laura Bridgeman, the pupil of Dr. Howe of Boston; we have now to note the death of Mary Bradley, an English Deaf and Blind Mute, with whom the same means of instruction had been employed, as have already been described in reference to Laura Bridgeman. The failure of her experienced and indefatigable teacher, in successfully applying to Oliver Oswell, another mute, destitute of sight and hearing, the method he had found so effective in communicating languages, and all consequent instruction to Laura Bridgeman, gives an additional interest to the case now referred to.

Painful, and seemingly irreparable, as were the privations of Laura Bridgeman, she passed her early years in a comfortable New England home, under her mother's care; and amid the kindly sympathy of friends and neighbours; one of whom especially, strove in various simple ways to convey to her some knowledge of the outer world. But it was altogether different with the unfortunate blind and deaf mute now referred to. Mary Bradley was deprived of sight and hearing when not more than five years of age, and was found by the English poor-law authorities, in a state of absolute destitution, in a cellar, where she had been abandoned by her heartless parents. She was placed, at first among the children training in Swinton School; but her complicated case of loss of senses seemed to place her beyond the reach of every available means of communicating knowledge, and she became a mere plaything and butt for the other children. She was not, however, long left exposed to such neglect. It fortunately chanced that Mr. Patterson, the master of the Deaf and Dumb Institution at Old Wafford, had his attention called to the case of Laura Bridgeman, chiefly through the statements set forth in Mr. Charles Dickens' "American Notes"; and he obtained the permission of the Governor of that Institution to have her placed under his care. She was accordingly removed to the Old Wafford Institution in July, 1846, and has continued to reside there until her recent death. But in her case bodily illness precluded her from that joyous perseverance in the use of what might not inaptly be called her recovered faculties, which renders Laura Bridgeman so pleasing a subject of study. Mary Bradley closed her life in June last, after nine years of almost continual suffering; so that, during a large portion of the period of her residence at Old Wafford, she has been an object of painful interest to her kind guardians in that valuable institution.

The following brief notice refers to the efforts for her instruction which immediately followed her removal from Swinton School; and, though it lacks the minute details which give so much interest to the narrative of Dr. Howe's training of Laura Bridgeman, a comparison of it with the facts already stated in reference to the latter, will suffice to show many points in common in the two cases:—

"Mr. Patterson had set himself a most difficult task, and many weeks elapsed before the slightest sign of intelligence was manifested. After six weeks of daily perseverance, however, her face suddenly indicated that her mind had received an impression. Notwithstanding her complete isolation from all the sources of enjoyment around her and the difficulties of communicating information to her, she by slow degrees made considerable progress in acquiring a knowledge of language, and was enabled not only to read the books printed in relief for the blind, but was also able to communicate her thoughts in writing to others. This latter she performed by means of a tablet which Mr. Patterson invented for her, and by its aid she held correspondence with Laura Bridgman and others. She became quite an adept at the peculiar language of the deaf and dumb. She was also provided with a case of types, which she "set," and which was of great value to her, not only as a means of communicating but also as exercise in languages. Her favourite books were the gospels, which she frequently read, drawing comfort and satisfaction from them. Her temper was peculiar, probably from the peculiarity of her case; as a rule she was amiable and tractable, but she was from time to time subject to fits of sullenness and irritation, when nothing could please or pacify her, and she was left to herself until, as if exhausted, she would return to her usual mood, and continue tractable for weeks. Much of her time she spent in knitting and sewing small articles, which she generally gave to friends and those who were kind to her."

The generous zeal with which her humane instructor devoted himself to the rescue of this seemingly hopeless outcast from her lonely and dark prison-house is deserving of the highest encomiums; and none the less so from the quiet and unobtrusive manner in which his successful labours have been carried out. The remains of Mary Bradley have been laid to rest in Harpurhey Cemetery; and it is pleasing to be able to add that she died in the firm conviction that she was entering upon a life where the senses of which she had been deprived here would be fully developed.

NOTICES OF PAPERS RELATING TO NATURAL HISTORY RECENTLY RECEIVED.

First in order we place a paper by Professor Morse, of Portland, on *A Classification of Mollusca, Based on the Principle of Cephalization,* which appeared in the proceedings of the Essex Institute, Vol. IV., No. VI., and which has been in our hands for some time, but which seemed to us of such importance that we were anxious to bestow upon it a fuller consideration than other occupations at the time permitted; and we reserved it with the intention of expressing at large our views on the whole subject. We regret that this intention must still remain unfulfilled; but we will at least express our sense of the knowledge, thought, and original research displayed in the paper, and give a short account of its purpose and character, with a few critical remarks. The author makes it a special object to determine the common plan of the Molluscous sub-kingdom, which he regards as still remaining in obscurity:—

"Finding the universality of vertebration among the Vertebrata, of articulation among the Articulata, and similarly of radiation among the Radiata, I could not but believe that in the Mollusca some plan lay hidden, which, when unfolded, would as definitely convey their type, and unite them all, as in the other branches. It is not enough to call them soft bodied animals; for in considering their shell as a part of their organization, we have among them many of the hardest animals known, and we also have an equal number of soft bodied animals in the other branches. Their bilaterality, as expressing anything definite, is an equally unsatisfactory character. Prof. Huxley has given an archetype, or common plan of the Mollusca, as he conceives it, with many truthful homologies, in the article 'Mollusca,' English Cyclopedia, Vol. III., p. 885. In his figure of the archetype, however, which is bilaterally symmetrical, we have details of structure only."

He adds:—

"Prof. Dana has been the first to publicly announce the plan of Mollusca, when he says, 'The structure essentially a soft, fleshy bag, containing the stomach and viscera, without a radiate structure, and without articulations.'" *

He then states that,

"In the year 1862, Mr. Alpheus Hyatt had independently worked out a similar result."

Adding:—

"Mr. Hyatt also proposes the name Saccata as more fully and truthfully expressing the type, than the unmeaning word Mollusca. This name not only expresses the plan, but is equivalent to the titles Vertebrata, Articulata, and Radiata, and is in no way a qualitative appellation."

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* Dana's Manual of Geology, p. 148.

It appears to us, however, that Prof. Dana's account of the Molluscan plan fully justifies the established name, which there would be great inconvenience, and no compensating advantage, in changing for that proposed by Mr. Hyatt.

Proceeding, now, to the main object of the essay, we endeavour to select what is most necessary for conveying a just idea of the author's views, in a series of short quotations :—

"In the following considerations, all preconceived ideas regarding the relative positions of the dorso-ventral, and antero-posterior diameters of the animal must be laid aside, and the essential structure of the animal if rightly understood, must be our guide. The gradual morphological changes of the contents of the sac, and all other relations, are based on the principle of Cephalization. In the plate presented (Series I) I have given a typical figure of the six prominent groups of the Saccata;* namely, Polyzoa, Brachiopoda, Tunicata, Lamellibranchiata, Gasteropoda, and Cephalopoda.

"For obvious reasons, only the intestine, head, and pedal ganglia within the sac are represented. These six figures are placed in their normal position, anterior pole downward, the dorsal region is turned to the left. Commencing with the Polyzoa (Series I, P) we have the sac closed, while the mouth and anus terminate close together at the posterior pole of the sac; the mouth occupying the extreme posterior position, and by a dorsal bend of the intestine upon itself, terminate dorsally. The nerve mass is found between the oral and anal openings.

"In the Brachiopoda (Series I, B) we have a permanent invagination of the sac, and the mouth, as in Terebratula, already occupies a position some distance from the posterior edges of the overlapping shells, and the brachial coils permanently occupy the space thus made.†

"We have in this group a dorsal flexure of the intestine, and a tendency to terminate as in the Polyzoa. In Lingula it terminates posteriorly and at one side. By the permanent inversion of the sac, the mouth makes a great advance toward the anterior pole.

"(The manner in which I view the Brachiopoda, if true, will entirely reverse the accepted poles of their structure. What has been considered as dorsal, is here regarded as ventral, and what has been considered as anterior, is here regarded as posterior. Further remarks on this will be made hereafter).

"Thus far the balance of structure has been thrown to the posterior pole of the sac, and though we see a cephalization, or concentration of the muscular system and viscera, toward the anterior pole in Brachiopoda, yet that pole being essentially closed, we have no function manifested at that end, except the degradational one of adhesion. In the Tunicata (Series I, T) we have, through continued cephalization, the mouth thrown to the bottom of the sac, or nearer the anterior end, and now the anus terminates behind the mouth, and posteriorly.

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* These figures are diagrammatic outlines, enabling the reader more readily to follow the author's ideas.

† "Terebratulina caput-serpentis, and Crania anomala, projected their cirri beyond the margin of the open valves, and moved them as the Polyzoa move their oral tentacles, but in no instance were the arms extended." Woodward's Treatise, p. 466.

"The heart has also followed the intestine in its rotation and becomes anterior, and partially dorsal. The nerve mass is still posterior, and occupies a position between the two openings as in Polyzoa.

"In these three classes; namely, Polyzoa, Brachiopoda, and Tunicata, the sac is essentially closed at the anterior end, and consequently the mouth opens toward the posterior end, and with few exceptions all are attached by the anterior end.

"This makes a natural division, corresponding to the Molluscoidea of Milne-Edwards, the Anthoid Mollusks of Dana, and a portion of the neural division of Huxley. In the Lamellibranchiata (Series I, L) we have the sac opening anteriorly, and the mouth permanently occupying the anterior region, though in the lower forms pointing posteriorly, and in all cases the tentacular lobes pointing in that direction, and the mouth bent downward (ventrally), and partially obstructed by the anterior adductor, or by the undivided mantle.

"In Gasteropoda (Series I, G) the posterior end of the sac becomes essentially closed, and the ambient fluid now finds access to the gills through the anterior (though partially ventral) portion of the sac, while with Cephalopoda (Series I, C) the opening is all anterior. Thus far we have traced the gradual cephalization of the contents of the sac, and of the sac itself. The dotted lines X X, running through the oral opening of each figure in Series I of Plate, show the gradual advance of this opening from the lower to the higher classes. In the lowest class all the display of structure, with the oral and anal openings, lies at the posterior pole of the sac. In this highest class, all this display of structure lies at the anterior pole. Advancing from the Polyzoa, by the gradual advance of the mouth, the posterior pole becomes less prominent. Even when the sac opens anteriorly as in the Lamellibranchiata, the posterior end of the sac remains open, and the mouth, partially inclined that way, receives its food from that end; the food being conducted to the mouth by ciliary motion as in the three lower classes. The nature of their food is also identical, being of an infusorial character, and as such it is obvious that masticating organs, or biting plates, such as we find in the two higher classes, are not needed.

"So long also as the posterior end of the sac remains open, the anus terminates at that end; when this opening becomes closed, as in the higher classes, the anus seeks an outlet through the anterior opening, and the mouth, that before received its food from the posterior end of the sac, and by ciliary motion, now distinctly points the opposite way, and is furnished with the proper organs to procure food, the nature of which requires separation and trituration.

"In nearly all the foregoing homologies, and also the position in which I place the Tunicate sac, I am sustained by the writings of eminent naturalists. With the Brachiopoda, however, my views completely reverse the accepted poles of the body, though, even here, according to "Woodward's Treatise on Mollusca," page 204, Forskahl and Lamarck "compared *Hyalea* with *Terebratula*;

but they made the ventral plate of one answer to the dorsal valve of the other, and the anterior cephalic orifice of the pteropodous shell correspond to the *posterior* byssal foramen of the bivalve!" And, if the views I advance prove correct, they were precisely right. In all my previous attempts to homologize the different classes, I had always met with an obstacle in the apparently aberrant characters of the Brachiopods: never for a moment doubting the truth of the accepted views, that indicated the regions to be called dorsal and ventral, as such, I labored in vain. When I undertook to interpret the relation of these classes on the principle of cephalization, I found that these accepted views must be doubted, and it was with amazement that I beheld such unlooked for results: that the so-called dorsal region is really the ventral region."

To us the view entertained by the author, of the dorsal and ventral surfaces of Brachiopoda, or Palliobranchiata, does not appear to be the greatest difficulty. We suspect that the Molluscoidea of Milne-Edwards—the Anthoid Mollusks of Dana—though by no means judiciously separated as a sub-kingdom, really form together one class. The Monomyarian Lamellibranchiates, on the other hand, need by no means be separated from the rest of that class; but we are well persuaded that no natural and useful view of Molluscan animals can ever be given without treating Pteropoda as a distinct class. The special organs which mark them out as the expression in their sub-kingdom of motory power are highly characteristic. The comparatively small extent of the class, which really indicates that motory power is opposed to the Molluscan plan of structure, is certainly no argument for uniting it with Gasteropoda; and if the detection of certain homologies of parts were so we might soon compress the whole sub-kingdom into a single class. The structure and arrangement of the suckers, in some species, would of itself alone go far with us to confirm Cuvier's view of the position of the class, as next to Cephalopoda.

We thus arrive at five classes, representing five tendencies of structure, which we believe to be everywhere observable throughout the animal kingdom; and our great difference from Mr. Morse, in our conception of the true classes in this sub-kingdom, interferes with our power of immediately estimating and applying some considerations offered by him, which deserve attention, and possess interest. His speculations respecting polarity we could not make intelligible in few words without the convenience of figures. His concluding remarks are rendered obscure and repulsive by Prof. Dana's peculiar and highly objectionable terminology. Taking it as a whole, this short essay is of considerable importance, and proves its author to be an able as well as earnest cultivator of Malacological Science.

Among contributions to Natural Science, published in various periodicals which we have received through the kind attention of their authors, we name "Notes on the Embryology of Star-fishes," from the Annals of the Lyceum of Natural History of New York, by Mr. Alexander Agassiz, who follows up, with great credit to himself and advantage to science, the labours of his distinguished father. "Notes on Certain Terrestrial Mollusca, with Descriptions of New Species," extracted from the same work, by Thomas Bland; "Remarks," by the same naturalist, eminent for his knowledge of Terrestrial Mollusks, "on the Origin and Distribution of the Operculated Land-shells which Inhabit the Continent of America and the West Indies," extracted from the American Journal of Conchology; two parts. This is a highly interesting and valuable paper. We may observe that the author explains that in using the term *origin*, applied to families, &c., he refers to the country in which there is the maximum specific representation.

Again, we have from Leo Lesquereux, a paper "On Fucoides in the Coal Formations." This must prove attractive not only to the Geologist and the Botanist; but, in its discussion of the origin of petroleum, will excite the curiosity of the practical man, who would expect to be enabled to judge more satisfactorily of the probable durability of the supply, if he had some good information respecting the origin and history of the substance. Though our quotation must be of some length, we expect our readers will be pleased to see the portion of Mr. Lesquereux's paper which relates to the origin of petroleum :—

"*Does Petroleum Originate from the Decomposition of Marine Plants?*—Considering the question of the origin of our deposits of petroleum, some geologists have expressed the opinion that they might be due to the decomposition of marine plants, as coal is the result of the decomposition of a terrestrial vegetation. This conclusion is but natural, for there exists an evident correlation between the formation of both kinds of deposits of bitumen. But this relation cannot be, or at least has not yet been, established by direct proofs or experiments, and that is probably the cause why the subject has not been studied more in detail.

"*Fecundity of the Marine Vegetation at the Palæozoic Ages.*—There is no doubt that the marine vegetation of the Palæozoic ages can be compared, for luxuriance, and in some measure for its composition also, to the terrestrial vegetation of the coal epoch. From the Upper Devonian down to the Lower Silurian, some strata of shales are not only covered, but indeed filled, sometimes for hundreds of feet in thickness, with fossilized forms of Hydrophytes. These evidences of a primordial vegetable world are far more numerous than the remains of land plants in the shales of the Coal Measures. Nevertheless, they appear to belong to plants of a soft tissue, mere cellular, probably mostly unicellular vegetables, the debris of which had not by much the same chances of fossilization.

"The superabundance of vegetation testified by fossil remains in Palæozoic ages is in accordance with one of nature's most evident laws. The amount of carbonic acid gas is acknowledged to have been, at the Palæozoic times, far greater in the atmosphere, and also in the water of the seas, than it is now. The prodigious luxuriance of the vegetation of the coal period is rightly ascribed to this fact. It cannot be supposed that in the sea the vegetation, which is there also the intermediate agent between animal life and unorganized bodies, gaseous or mineral, should have been in a diminutive state when its action was the most in demand, like its development, for the purification of the water and the transformation of the superfluous carbonic acid gas into organism and oxygen.

"We have no proofs from fossil remains that the Hydrophytes of old attained a very large size. The largest circular fronds of *Fucoides Cauda-galli* show a diameter of about one foot; the greatest length of the branching Fucoides in the Chemung is from two to three feet. But we cannot judge all the vegetable representatives of an epoch from a few fossilized specimens. These may have belonged to a species of a more compact organization, or to some kind of Corallines, which had their surface covered with a hard crust of lime, while other groups of a soft, mere cellular tissue, which had representatives of large size, have been totally decomposed and destroyed. There is no need however of this hypothesis, on the size of the Palæozoic Algæ, to argue by comparison on the fecundity of the marine vegetation of old. Small species of Hydrophytes, in our time, afford sufficient analogies. The great bank of *Sargassum*, which extends between the 20th and 45th parallel of latitude, covers, according to Humboldt's computation, a space of more than 260,000 square miles. In places this floating bank is so thick as to arrest the progress of vessels, and it appears at present to be of the same extent and to occupy the same place as when it was first noticed by navigators. What can we then infer to have been the result of a vegetation whose force was at least double of what it is now, and which has written its history in whole strata of great thickness?

"*Analogy of Life and Functions in both the Terrestrial and the Marine Vegetable World.*—It cannot be presumed that this whole vegetable world of Palæozoic seas has left nothing after it but useless petrified remains. In the march and development of nature's productions, nothing of the materials employed is ever lost. The smallest atom of matter is preserved in some way, if not constantly remodelled. Thus we find the key of a new life, of a new creation, in the remains of a destroyed one. Thus, some leaves, preserved by fossilization, in the shales of the Coal Measures, open to our view not only the whole world of an ancient vegetation, but its predestinated result, coal deposits, slowly laid up by its agency. Thus also the remains of marine plants, in the shales of the

Devonian, point out, I think, not only the fecundity of an ancient marine vegetation, but its result in the contemporaneous deposits of petroleum. Indeed, both kinds of vegetation have great analogy of life, if not of organism. The plants of the coal, by their structure, the form of their long pointed leaves or indefinitely divided fronds, were shaped for the absorption and the transformation from the atmosphere of the greatest amount of carbonic acid gas into woody tissue. The Chlorosperms of the Palæozoic times, with their simple bladdery conformation and their green color, were undoubtedly prepared to perform in the water the same functions as the coal plants performed in the atmosphere. As the result of terrestrial vegetation has been, first woody tissue, and then, by its decomposition, coal, so the result of marine vegetation has been, first cellular tissue, filled with a kind of liquid carbon, and as the carbon is unalterable, the decomposition of the plant has left it free as fluid bitumen or petroleum.

"*What Chemistry Indicates on the Subject.*—We cannot follow, in our day, by means of the accumulated remains of Hydrophytes, the slow process of carbonization, and compare its results at different stages of its development, as we can by help of the remains of land plants, in the formation of peat bogs, lignites, &c. This only has been observed: When marine vegetables are thrown upon bogs and mixed with terrestrial plants as compound of the peat, they do not leave any trace of organism or primitive form, and the peaty matter, then of a deeper black color, is a softer, more homogeneous compound, richer in bitumen. When, detached by storms or tides, Algæ are heaped in great masses on sandy shores, they promptly decompose, passing first to a black, soft paste, and then to a glutinous fluid of the same color, which exhales a strong disagreeable odor, and penetrates the sand. Chemistry has not analyzed these matters resulting from the decomposition of Hydrophytes, nor even species of marine Algæ;* and therefore it is not proved that there exists a direct relation between them and petroleum. Chemistry demonstrates, however, that petroleum and coal are both compounds of the same elements; and the former matter being proved of vegetable origin, the second is neccessarily, by induction, referred to the same † And as some substances, like iodine, which was formerly procured from marine plants only, are now more abundantly obtained from petroleum, chemical analyses, I think, confirm in that way the relation between petroleum and Hydrophytes.

"Though chemistry is not directly interested in it, it is but right to refer here to a peculiar fact which bears upon the subject. The Algæ, especially the group of the *Caulerpæ*, feed some of the animals of the seas, remarkable for the size and the prodigious fatness of their bodies. The green fat of the turtles, says Harvey,‡ so much prized by aldermanic palates, may possibly be colored by the unctuous green juice of the Caulerpæ, on which they browse. The same could be said of the color of the Devonian petroleum, which is exactly that of the Chlorosperm Hydrophytes. It is not positively ascertained, I believe, if whales and other marine mammifers of this kind, whose bodies are large reservoirs of oily matter, are true Algæ-feeders; but when killed, the stomachs of these animals are always found mostly filled with marine weeds.

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* Prof. Liebig, to whom I wrote a *résumé* of my opinion on the subject, with the request that he would point out to me the result of chemical analysis of marine plants, if there were any, either in support or discredit of my ideas, kindly answered: "That there were unhappily no analyses of species of Fucus, or of other Hydrophytes, which could be used as affording support to my views. But that my arguments, based on exact researches, were so conclusive, that for himself, at least, they had removed any doubt of the truth of the theory.

† See, on this subject, a very remarkable and most instructive paper, by Sterry Hunt, in he American Journal of Science and Arts (2), pp. 156 to 171.

"*Geological and Geographical Distribution of Petroleum Deposits and Fucoidal Remains.*—A last argument, no less conclusive on the subject, is taken from the geological and also from the geographical relation between deposits of petroleum and Fucoidal remains.

Oil-bearing strata are seen in the Coal Measures mostly inferior to the big bed of coal No. 1, which is often a cannel coal; and sometimes also, but rarely, at a higher horizon, as, for example, below coal No. 3, and also coal No. 12, generally in more or less evident connection with cannel coal. This has probably led to the opinion, still admitted by some geologists, that all the deposits of petroleum owe their origin to a slow decomposition of coal, under some peculiar influences. As there has not heretofore been observed any indications that remains of marine plants might have existed at some places mixed with the aerial plants of the bogs of the coal epoch, it was not easy to account for such a phenomenon as that of the formation of coal and petroleum at the same horizon and under the same circumstances. But this curious fact, I think, is explicable now. When the combustible matter has been formed, especially from the remains of aerial plants, whose tissue was mostly vascular, or vascular and cellular, like that of the *Lepidodendron*, *Sigillaria*, ferns, etc., it becomes by mineralization a hard coal, with thin layers or distinct laminas, sometimes shining, sometimes mixed with opaque layers and flakes of charcoal, and giving by combustion, a proportion of ashes according to the nature of the wood. When it has been formed merely by floating fresh-water vegetables, like *Stigmaria* and its leaves, the compound, originally half fluid and more easily decomposed, becomes, by the slow process of combustion, compact, homogeneous, without apparent layers, tending to mere bitumen, thus forming the different varieties of cannel coal. Now, I believe that when this floating vegetation has been more or less densely intermixed with marine plants, and perhaps also influenced by marine water, the almost total absence of woody fibres has casually prevented the bedding of the material, and so, by slow maceration part of it has been transformed into fluid bitumen. It is probably for this reason that we see, sometimes, as at Breckenridge, in Kentucky, a bed of cannel coal so nearly decomposed into petroleum that it can scarcely be used as coal, and at a lower level, even in close proximity, and where every trace of coal has disappeared, inferior strata of sandstone, strongly impregnated with petroleum.

"In descending from the base of the Coal Measures into the Devonian, we find deposits of oil nearly in the whole thickness of this formation, with the exception of the old red sandstone, equivalent of the Ponent and part of the Vespertine of Pennsylvania. All the plants of this formation, and they are numerous enough, belong to swamp or land plants, and no trace of petroleum has been seen in these measures. But down from this red sandstone, the Chemung is full of remains of Fucoides, and where they are found all the sandstone strata of this formation are more or less impregnated with oil.

" Still lower the black shales of the Hamilton group are so much charged with bitumen that they have often been considered as the true source of the Devonian petroleum. There the remains are nearly, almost totally, obliterated. A few teeth of fishes and small shells, very rarely large trunks of *Lepidodendron*, nothing more, at least in those extensive deposits, generally of great thickness, which border our Western coal basins. The color of these shales, and the bitumen which they contain, indicate a formation under water, under the influence of a powerful vegetation; and a marine vegetation, without doubt; else, besides the well-preserved trunks of *Lepidodendron*, which have probably been brought floating, we should find there other remains of aerial plants. At Worthington, in Ohio, where I have spent much time in searching for fossil remains in these black shales, I have seen them often covered with round spots of coaly matter, varying in diameter from half an inch to one foot, showing no trace of organism, and resembling some kind of round, hard Ulvaceæ, like those which are seen in great quantity attached to the muddy shores in shallow water.

" Descending further down in the Lower Devonian and Upper Silurian, we see there also the rocks saturated with petroleum, and generally marked by an abundance of Fucoidal remains. It is probably from the rocks of the Upper Silurian that Prof. Brogniart obtained his Fucoides from Canada. In Ohio and other Western States, where the Upper Silurian limestone is barren of remains, it does not show any deposits of petroleum. In Canada the same rocks have both Fucoides and fluid bitumen. Prof. Lesley, after an examination of the east end of Canada, Gaspé, wrote me (5th January, 1866): " All sorts of marine vegetation of Upper Silurian and Devonian ages seem there in great abundance, and petroleum everywhere in the Devonian, and oozing from the lower Helderberg limestone formation.

" Still deeper the Lower Silurian has small deposits of bitumen in cavities of limestone, even when every trace of organism has disappeared. This fact again is, I think, another indication of the relation of petroleum to a marine vegetation. For it is well understood that vegetable life has ruled the seas in its minute representatives, Diatomaceæ, Desmidiaceæ, long before animal life could be supplied or sustained by it. These diminutive and primitive oil reservoirs are attributable to the concentration and decomposition of a local surplus of that primordial vegetation.

" The geographical distribution of petroleum and that of the remains of marine Algæ present the same remarkable coincidence. At Oil Creek, Slippery Rock Creek, in the Chemung of Virginia, Ohio, Kentucky, everywhere indeed where oil has been seen, either in cavities or saturating the rocks, and where the strata were open to view, a remarkable amount of Fucoidal remains has been observed. This cannot be a mere casual coincidence.

" The discussion presented in the last part of this paper may then be closed by this assertion: That though the theory of the origin of petroleum from marine vegetables is not yet supported by direct experiments and conclusive proofs, the reasons in favor of it are weighty enough to merit due consideration. The more so, that if recognized as true, the theory presents an important chapter of the history of petroleum, and may prove of great value in its application."

We pass next to some productions of Dr. W. Lauder Lindsay, from the proceedings of the Royal Society of Edinburgh, the Edinburgh New Philosophical Journal, and other sources. We can only name a paper on the Tertiary coals of New Zealand; but we cannot name it without praise as a concise, yet full, clear, and well arranged summary of information on its subject. Of more general interest and in more immediate relation with our condition, as a great Colonial Government, is the essay entitled "The place and power of Natural History in Colonization, with special reference to Otago (New Zealand)," which is an excellent exposition of the practical value of the several branches of Natural Science in a newly settled country; the evils that may arise from ignorance, and the agencies by which knowledge may be collected and diffused; which, therefore, should be put in operation by a wise government; not because such knowledge is in itself interesting, ennobling, and deserving of cultivation, but on account of the practical benefits having a direct money value, which it confers on a community. Our statesmen would do well to consider such views, and an intelligent public ought not to disregard them. We have, perhaps, advanced beyond the need of some of the suggestions offered; but there are others well deserving of consideration; as, for example, the public importance of a botanic garden; and that not merely as a useful aid in College botanical instruction, but with a view to the improvement of society at large, and the diffusion of much important practical knowledge.

Dr. W. Lauder Lindsay is eminently a practical naturalist as well as a man of real science. Among the subjects which he has ably treated, we find "The Dyeing Properties of Lichens;" "Economical Applications of British Lichens;" "Substitutes for Paper Material;" "Botany, in its Applications to Common Life;" and (which we wish could meet with due attention here), Illustrations of the Value "Of a Knowledge of Vegetable Histology to the Medical Student and Practitioner." One of these subjects, which is of very great public interest, forms the subject of a popular lecture delivered with great success at Perth, and elsewhere, the syllabus of which is so suggestive and instructive that we have no hesitation in copying it entire in this place, notwithstanding that it is not very recent. We refer to the lecture on the "Substitutes for Paper Material." We wonder how it happened that, in naming the families of plants which may be tried with most promise for paper material, the Asclepias family escaped Dr. Lindsay's notice; perhaps the list would have been most conveniently given in a botanical arrangement, but the syllabus gives an excellent idea of the matter, and is full of instruction:—

PART I.—1. *Nature of present Paper Material.* Linen and cotton rags; hempen ropes and canvas;—that is, debris of fabrics made of flax, hemp, and cotton; re-use of old or waste paper: English Patent.—2. *Scarcity and high price of present Paper Material.*—Causes: 1. Increased demand for—*a.* Packing Papers; rapid extension of British commerce.—*b.* Writing Papers; postal reforms and extension.—*c.* Printing Papers; progress of the cheap press and popular literature; abolition of newspaper stamp duty; rise of colonial literature. (One Victoria paper circulates 12,000 copies daily.) Rise and progress of Paper Maché manufacture. Prospective abolition of paper duty; paper duty arrests development of paper trade; effect of abolition of the tax in creating increased demand. Increase on paper made in 1853, over that made in 1852, in Britain, was 23 millions lbs; consumption in 1855 was double that in 1845; average annual increased demand is 10 per cent.; price of best rags has risen from 26s. to 34s., and that of other qualities in proportion.

2. Diminished supply of rags, &c., in consequence of—*a.* American competition in continental markets; no paper duty in America; three times as much paper used in America as in Britain.—*b.* Continental nations printing more books and newspapers, and requiring home produce.—*c.* Use of cotton and flax-waste, &c., for Railway purposes.

3. *Necessity for providiag substitutes for present Paper Material.*—Limitation of supply of crude material the great obstacle to reduction of price of paper. Inducements to discovery of cheap, abundant, and good substitutes: "*Times*" prize of £1000.—Experiments and Patents in Scotland, England, Ireland, France, Germany, the United States, West and East Indies, &c.—Schaffer's "Sammtliche Papier-Versuche," 1772.—Hering's "Paper and Paper making,—ancient and modern," 1855.—Impetus given to study of economic applications of vegetable fibre by establishment of—*a.* Permanent Museums of Economic Botany, or of local or national Industry.—*b.* Temporary Exhibitions of local, national, or universal industry.

4. *Essentials of a good Paper Material: must consist of woody fibre; character of latter; "bast tissue."*—*a.* Cheapness.—*b.* Abundance and readiness of supply. —*c.* Ease of preparation; little loss in process of conversion.—*d.* Facility of being bleached.

5. *Accessory advantages in Manufacture of a cheap and good paper.*—*a.* Improved machinery for separating and pulping fibre.—*b.* Improved processes for

bleaching.—*c.* Economical applications of refuse, *e.g.*, as manure. Non-attention to these essentials or accessories the general cause of failure in experiment; cost and difficulty of pulping and bleaching chief obstacles to use of abundant and cheap fibres.

6. *Abundance of fibre-producing plants throughout the world.*—*a.* Home resources.—Present non-utilisation of properties and products of common weeds.—*b.* Our colonies as new fields of produce and export. "West India Hemp and General Fibre Company"; "Guiana Textile Association"; resources of India, Australia, New Zealand, Canada, Brazil, &c.

PART II.—ILLUSTRATIONS OF PLANTS YIELDING FIBRE SUITABLE FOR PAPER MAKING.—I. FLOWERING PLANTS. (*Phanerogamia.*)—1. *Flax Family.*—Flax; lint; tow; flax cotton; Jackson's flax paper.—Cultivation of flax in Scotland and Ireland; Irish Flax Co.—Proposed cultivation in India; memorial of Chamber of Commerce, Dundee.

2. *Nettle Family.*—*a.* Common hemp; Russia and Poland as chief fields of export; proposed cultivation in our colonies.—*b.* Indian hemp.—*c.* Common nettle; nettle muslin in Ireland; use of fibre in Holland and Germany.—*d.* Common hop; hop-bine.—*e.* China grass fibre.—*f.* Neilgherry nettle of India.

3. *Mallow Family.*—*a.* Cotton; scarcity in America; proposed cultivation in India, Africa, &c.—*b.* Garden hollyhock; patents of Mr. Niven of Keir Gardens, Stirling.—*c.* Marsh Mallow of Jamaica.—*d.* Common Mallow; tree Mallow.—*e.* "Cuba bast" of gardeners.

4. *Grass Family.*—*a.* Straw of oat, wheat, and other cereals. Straw printing and wrapping papers; straw note paper; disadvantages of straw paper; Coupier's and Mellier's patent; Drayton's patent.—*b.* Twitch or couch grass; Jeyes' patent.—*c.* Mat grass; cord grass; mountain melic grass; rye grass or darnel; oat-like grass; cock's foot grass; canary grass; crested dog's tail grass; sea reed, marram, or matweed.—*d.* Common hay; Antisell's patent.—*e.* "Esparte" of Spain.—*f.* Bamboo.—*g.* Sugar-cane; "megass" or "spent cane;" "cane trash."—*h.* Chinese sugar cane.—*i.* Maize or Indian corn.—*k.* Rice straw; China.—*l.* Tussac grass of Falkland Islands.

5. *Lime Tree Family.*—*a.* Common lime or linden tree: "Russian bast."—*b.* Basswood of United States and Canada—*c.* Jute; Gunny or rice bags of India; Smith and Holdsworth's patent.

6. *Thistle Family*—*a.* Common thistle; cotton thistle; Lord Berriedale's patent; thistle paper in France.—*b.* Burdock; coltsfoot; Irish patent.—*c.* Cudweed, or "everlasting flower," of United States and Canada; Andres' patent.—*d.* Common Mugwort.—*e.* Sunflower; experiments at Erith.—*f.* Jerusalem artichoke.—*g.* Ragweed, or groundsel.

7. *Pea and Bean Family.*—*a.* Common field pea and bean; stalk or straw; "pea shells;" everlasting pea.—*b.* Common broom; Niven's patent.—*c.* Common field clover.—*d.* Liquorice root of Pontefract.

8. *Plantain or Banana Family.*—*a.* Common plantain.—*b.* Common banana, of West and East Indies.—*c.* Manilla hemp: West Indies and United States.

9. *Mezereon Family.—a.* Nepal paper plant.—*b.* Lace bark.—*c.* Leather-wood of North America.

10. *Fir Family.—a.* Scotch fir: cones; leaves; pine-wool of Germany; M. Panewitz's patent; shavings and saw dust; Roth's wood paper; Hartmann and Schlesinger's wood pulp.—*b.* Norway spruce fir; Gross' patent.—*c.* Red Cedar of America.—*d.* Larch.

11. *Oak Family.*—Wood of oak; beech; Spanish chestnut; shavings and saw dust; "spent tan;" Horton's patent; M. Vivien's leaf paper.

12. *Willow Family.—a.* Common willow or osier; catkins; bark; wood; Burch's patent.—*b.* Aspen and black poplar; shavings and saw dust.

13. *Goosefoot Family.—a.* Red and white beet-root; Collyer's patent; use of fibre in France.—*b.* Mangold wurzel; Irish patent.

14. *Cabbage Family.—a.* Cabbage and its congeners,—broccoli, cauliflower, &c.; "kail-runts."—*b.* Swedish and Aberdeen Turnip; Irish patent.—*c.* Mustard; Jeyes' patent.—*d.* Horse radish; water cress.

15. *Sedge Family.—a.* Papyrus, or bulrush of the Nile.—*b.* Clubrush.—*c.* Common Galingale.—*d.* Cotton grass.

16. *Heather Family.—a.* Common ling; peat in Italy and Germany; Lallemand's and Clarke's Patent.

17. *Potato Family.*—Common Potato; "shaws" or stalks; rind and pulp; potato disease no material objection to use of fibre in paper making.

18. *Vine Family.*—Common grape vine; tendrils; "vine blight" no material objection to use of fibre in paper making.

19. *Iris or Cornflag Family.*—Common yellow water Iris or cornflag; Irish patent.

20. *Rose Family.—a.* Common hawthorn or May.—*b.* Common bramble.

21. *Crowfoot Family.*—Common traveller's joy.

22. *Cucumber Family.*—Common bryony.

23. *Bulrush Family.*—Common bulrush or reed mace.

II. FLOWERLESS PLANTS—(*Cryptogamia.*)—Consisting, as they do, wholly, or in great measure, of cellular tissue, may be practically disregarded as fibre-producers.

1. *Fern Family.*—Common Bracken Fern; Captain Brown's Patent.
2. *Horse-tail Family.*—Dutch rush; common ditch horse tail.
3. *Moss Family.*—Bog Moss, &c.
4. *Lichen Family.*—Beard Moss, &c.
5. *Seaweed Family.*—"Water Flannel."

The above classification is merely one of convenience, and not botanically accurate.

The fibre of many of the plants above enumerated is equally suitable for the purposes of the rope spinner, and cloth weaver.

The Lecture will be illustrated by Specimens of—1. Papers made from the fibre of a variety of plants,—British and Foreign.—2. The crude fibres separated from the said plants, and suitable for the purposes of the paper maker, rope spinner, or cloth weaver.—3. The plants which either yield fibres as above, or which might—under appropriate manipulation—be made to do so.

THE REV. GEORGE CLARK IRVING, M.A.

We have to record the recent death, under peculiarly sudden and painful circumstances, of an old and highly esteemed member of the Canadian Institute. The Rev. George Clark Irving, M.A., a distinguished graduate of the University of Cambridge, was selected to fill the Chair of Mathematics and Natural Philosophy, on the establishment of Trinity College, Toronto; and, at an early period after his arrival in the province, he began to take an active interest in the affairs of the Canadian Institute. For years he was a member of its council, and one of the editing committee of this journal. By his affability and courtesy he won the good-will of all with whom he was thus brought in contact; and, at a period when such questions as the abolition of Clergy Reserves, and the rights and privileges properly assignable to Provincial and Denominational Colleges, tended to intensify the bitterness of political and sectarian jealousies, and to impede cordial co-operation even within the peaceful arena of literary and scientific research, Professor Irving stood aloof from all narrow-minded display of party-spirit, and was esteemed no less for his conciliatory and courteous frankness in his intercourse with men of all parties, than for the firmness with which he maintained his own opinions on every fitting occasion. In 1857, Professor Irving resigned his Chair in Trinity College, and returned to England; but, after a comparatively brief interval, the high estimation in which he was held by the Council of the College was evinced by his being invited by that body to resume the duties of the professorship, along with others of a still more onerous and responsible nature, connected with the oversight of the resident students.

The return of Professor Irving to Toronto was welcomed by many friends, and by none more so than by his old colleagues in the Canadian Institute; but his active connection with the Educational and Literary Institutions of Toronto was speedily terminated by his promotion to the Principalship of the Collegiate School of Bishop's College, Lennoxville, rendered vacant by the election of his predecessor to the See of Quebec. In his new sphere, Mr. Irving's pleasing manners, and high acquirements, added to the reputation of the College; and its last session terminated amid the most gratifying evidences of the success of the department under his charge.

He had accepted the invitation of Bishop Williams to spend part of the long vacation with him, at Riviere du Loup; and, while still his guest, was drowned while bathing there, on the 15th of August last. The painful circumstances attending this melancholy event were intensified by the presence of Mrs. Irving, who witnessed the fatal occurrence, and vainly exerted herself to save her husband's life. Chief Justice Meredith, Mr. Brydges, and others, then resident at Riviere du Loup, hastened to the spot on learning the painful news, and every means was resorted to with the view of restoring animation, but in vain. Mr. Irving was in ill health, and is supposed to have been seized with a fit while in the water. As he was no swimmer, he was quite within his depth; and, but for some sudden, disabling cause, he could readily have reached the shore. He was only in his 38th year, and was fondly believed to have many happy and useful years before him, when thus suddenly cut off in the prime of life, amid the affectionate regrets of a numerous circle of pupils and friends.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—APRIL, 1866.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *min.* 33 *sec. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M.	10 PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 PM	Re-sul't.	ME'N		
					°	°	°	°	°																			
1	29.510	29 738	—	—	34.9	38.8	—	—	—	.177	.135	—	—	87	57	—	—	W b N	W N W	Calm.	N 50° W	3.0	12.0	0.0	5.70	5.92	...	...
2	.849	.841	29.849	29.8637	32.7	38.1	33.4	35.28	— 1.35	.165	.135	.134	.146	88	58	70	71	N	E b N	N E b E	N 74 E	2.8	8.2	2.0	4.86	5.03	...	...
3	.829	.780	.688	.7587	34.2	42.1	41.7	39.87	+ 2.85	.147	.110	.148	.138	75	40	56	56	E b N	E	E b N	N 74 E	7.6	13.0	7.6	8.24	8.29	...	...
4	.679	.642	.577	.6323	37.8	51.1	42.8	43.77	+ 6.43	.165	.246	.250	.221	72	65	90	77	E N E	E	E b N	N 88 E	2.2	2.0	2.6	3.04	3.08	...	...
5	.516	.495	.681	.5777	33.8	61.2	45.0	49.75	+12.03	.173	.387	.239	.281	89	71	80	77	Calm.	S W b S	W b N	S 78 W	0.0	4.0	5.0	6.30	7.89	...	...
6	.809	.786	.880	.8325	26.0	40.3	33.4	36.35	— 1.68	.153	.150	.120	.131	73	59	62	61	W b S	W b S	W N W	N 83 W	5.0	14.4	11.5	10.39	11.00	...	...
7	.921	.831	.826	.8537	30.6	35.3	30.9	32.02	— 6.40	.144	.089	.134	.119	85	43	77	67	W N W	N N W	N N W	N 40 W	5.2	5.2	5.8	6.34	7.92	...	...
8	.798	.826	—	—	29.5	40.2	...	—	—	.136	.099	—	—	83	39	—	—	N b W	S b W	N N W	N 38 W	8.8	5.2	7.4	2.50	6.23	...	...
9	.938	.950	.914	.9312	29.8	45.0	31.3	36.40	— 2.63	.088	.096	.100	.094	52	33	56	46	N b W	S S W	Calm.	S 8 W	5.0	5.6	0.0	1.49	2.58	...	...
0	.866	.740	.643	.7400	32.0	46.4	39.6	40.53	+ 1.12	.121	.148	.176	.151	66	46	72	60	S S E	E b S	E b S	S 70 E	1.0	9.4	0.5	3.07	4.07	...	...
1	.661	.668	.679	.6728	39.2	55.1	43.2	46.25	+ 6.52	.171	.207	.209	.203	72	46	74	65	Calm.	S b W	Calm.	S 10 W	0.0	3.0	0.0	0.96	1.13	Inp.	...
2	.679	.505	.401	.5187	39.2	56.2	54.7	51.60	+11.47	.190	.202	.392	.245	79	44	91	64	E b N	E S E	W b S	S 54 W	0.4	5.8	16.8	4 53	8.50	...	...
3	.718	.886	.882	.8365	41.0	49.3	36.8	42.15	+ 1.72	.184	.193	.181	.181	71	54	83	68	W N W	S S W	Calm.	N 64 W	17.4	5.8	0.0	3.50	6.01	.215	...
4	.748	.498	.611	.6103	37.8	43.2	39.2	40.48	— 0.25	.173	.190	.155	.166	76	68	64	65	E b N	E b N	Calm.	N 73 E	11.2	2.2	0.0	2.84	3.94	...	...
5	.738	.824	—	—	34.9	45.4	—	—	—	.167	.179	—	—	83	59	—	—	W b S	S b E	W	N 56 W	1.0	5.6	2.1	2.04	4.06	...	...
6	.867	.864	.879	.8682	37.1	49.7	43.5	44.43	+ 2.95	.174	.141	.186	.172	78	38	66	59	N E	E b N	E b N	N 80 E	4.5	18.2	11.0	11.40	11.46	...	...
7	.912	.914	.920	.9190	42.8	56.5	45.4	48.90	+ 7.15	.240	.280	.253	.259	87	62	83	75	E b N	E	Calm.	N 89 E	8.2	8.0	0.0	4.28	4.30	...	...
8	.906	.803	.726	.8022	45.7	59.1	52.6	53.77	+11.70	.268	.322	.332	.312	87	64	84	76	Calm.	E b S	E b S	S 71 E	0.0	4.8	1.0	2.66	2.78	...	...
9	.737	.759	.732	.7368	52.6	64.8	49.0	56.42	+14.07	.364	.463	.326	.398	92	75	94	87	Calm.	N N E	E	N 78 E	0.0	3.0	12.2	6.16	6.88	.010	...
0	.600	.477	.393	.4790	47.9	59.4	54.0	52.52	+ 9.68	.301	.353	.346	.324	90	69	82	82	E N E	E b S	S W	S 84 E	5.0	3.2	0.5	0.59	1.02	.160	...
1	.307	.172	.242	.2353	50.0	64.1	51.5	56.35	+13.25	.345	.269	.220	.274	96	44	58	64	S W	S W b S	N N W	S 58 W	2.0	18.2	3.2	7.07	9.00	.210	...
2	.282	.278	—	—	44.3	61.2	—	—	—	.239	.211	—	—	82	37	—	—	Calm.	W b N	N b W	N 42 W	0.0	15.0	8.4	4.68	6.75	...	...
3	.258	28.982	28.929	.0352	42.1	42.1	36.0	40.60	— 3.10	.204	.223	.206	.213	76	83	97	85	N N E	N N E	N W b N	N 15 W	11.2	19.0	28.5	21.90	24.31	...	...
4	28.928	29.021	29.105	.0268	33.8	46.1	36.7	38.87	— 5.13	.157	.154	.098	.132	81	48	43	56	N W	N W b W	W	N 61 W	34.0	29.0	12.6	19.45	20.37	1.080	...
5	29.125	.158	.336	.2170	32.0	45.0	34.9	37.65	— 6.75	.121	.081	.131	.114	66	27	65	52	W b N	N W b W	W N W	N 56 W	7.0	15.5	5.0	13.95	14.46	...	Inp.
6	.427	.506	.588	.5123	34.5	45.4	37.0	39.15	— 5.65	.163	.111	.141	.135	82	35	64	58	W N W	N W	N W	N 44 W	13.6	24.2	5.0	11.74	11.81	...	...
7	.685	.639	.560	.6231	38.9	49.3	43.2	43.92	— 1.10	.159	.164	.182	.170	67	46	64	59	N b W	S S W	S S W	S 89 W	4.5	5.2	0.5	0.10	2.67	...	Inp.
8	.407	.216	.474	.3632	42.1	53.6	45.3	47.50	+ 2.10	.178	.214	.155	.190	66	51	50	57	E N E	E	W N W	N 59 W	4.0	4.8	26.0	8.26	12.52	Inp.	...
9	.626	.551	—	—	39.6	53.6	—	—	—	.150	.063	—	—	61	14	—	—	W b N	W b N	W N W	N 68 W	4.5	33.0	9.3	18.49	18.70	...	...
0	.665	.581	.546	.5898	33.8	50.0	39.9	41.97	— 4.08	.129	.139	.078	115	66	36	32	43	N W b W	S b W	N	N 49 W	11.5	6.0	5.0	3.29	5.92	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	29.6415	29.5886	29.6028	29.6094	38.30	49.94	41.64	43.86	+ 2.87	.187	.203	.196	.195	77	52	71	65	....	....	....	....	6.02	10.28	6.32	... ...	7.95	1.675	Inp.

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL, 1866.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer .... 29.972 at 8 a.m. on 2nd } Monthly range =
Lowest Barometer .... 28.927 at mid. on 23rd } 1.045 inches.
Self-registing Thermom. { Maximum Temperature ....71°0 on 21st } Monthly range =
Minimum Temperature ....28°5 on 9th } 42°5
Mean maximum Temperature ....52°87 } Mean daily range=
Mean minimum Temperature ....36°01 } 16°86
Greatest daily range......36°2 from a.m. to p.m. of 5th.
Least daily range .... 6°1 from a.m. to p.m. of 6th.
Warmest day.........19th...Mean temperature...............56°42 } Difference = 24°40
Coldest day........... 7th ...Mean temperature...............32°02 }
Maximum Radiation. { Solar..113°0 on 22nd } Monthly range =
Terrestrial .... 15°0 on 30th } 98°0
Aurora observed on 1 night, viz:—17th.
Possible to see Aurora on 18 nights; Impossible on 12 nights.
Snowing on 2 days; depth inapp; duration of fall 1.6 hours.
Raining on 7 days; depth 1.675 inches; duration of fall 20.3 hours.
Mean of cloudiness = 0.58.
Most cloudy hour observed, 8 a.m.; mean = 0.67; least cloudy hour observed, 10 p.m.; mean = 0.47.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
2342.03	566.89	1365.59	2990.32

Resultant direction N. 42° W.; Resultant velocity 3.34 miles per hour.
Mean velocity...............................7.95 miles per hour.
Maximum velocity.........................38.5 miles, from 8 to 9 p.m. of 28th.
Most windy day.........23rd............Mean velocity, 24.31 miles per hour. } Difference=
Least windy day.........20th............Mean velocity, 1.02 ditto } 23.29 miles.
Most windy hour ...... 1 p.m.........Mean velocity, 11.20 ditto } Difference=
Least windy hour...... 2 a.m ....Mean velocity, 4.70 ditto } 6.50 miles.

April 10th. Solar halo during forenoon. 12th. Solar halo. 19th. Fog at midnight. 20th. Fog 6 a.m. 21st. Dense fog 6 a.m. 21st. Solar halo, lunar halo at midnight, wind in strong warm gusts during afternoon. 23rd. Very stormy day, wind and heavy rain. 25th. Solar halo at noon, lunar halo during evening. 30th. Solar halo, lunar halo at midnight.

April 5th. Robins numerous. 11th. Butterflies observed. 14th. Swallows observed. 18th. Frogs heard.

April was on the whole dry and warm. The latter part, however, was cold and windy.

COMPARATIVE TABLE FOR APRIL.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant.		Mean Force or Velocity.
										Direction.	V'y.	
1840	42.4	+ 1.4	65.9	25.3	40.6	14	3.420	2	...	...	...	....
1841	39.2	— 1.8	62.9	22.1	40.8	3	1.370	3	...	...	...	0.51 lbs.
1842	43.1	+ 2.1	39.5	21.6	67.9	8	3.740	2	...	...	...	0.57
1843	40.9	— 0.1	70.0	15.1	54.9	7	3.185	3	0.1	...	...	0.46
1844	47.5	+ 6.5	74.5	17.2	57.3	10	1.515	1	Inp.	...	...	0.24
1845	42.1	+ 1.1	66.0	14.8	51.2	11	3.290	4	1.5	...	...	1.00
1846	44.0	+ 3.0	79.4	24.4	55.0	10	1.300	2	1.3	...	...	0.55
1847	39.2	— 1.8	65.6	8.4	57.2	8	2.870	2	4.0	...	...	0.59
1848	41.3	+ 0.3	65.4	26.5	38.9	5	1.455	1	0.5	N 77° W	1.46	4.89mls.
1849	39.0	— 2.0	70.9	23.2	47.7	10	2.655	2	1.7	N 43° W	3.14	7.50
1850	37.9	— 3.1	63.2	18.2	45.0	7	4.720	2	1.1	N 39° W	1.12	7.64
1851	41.3	+ 0.3	59.2	25.8	33.4	11	2.295	3	1.2	N 14° E	2.52	8.07
1852	38.2	— 2.8	53.8	19.8	34.0	6	1.990	4	9.4	N 23° E	2.44	6.68
1853	41.9	+ 0.9	65.7	27.0	38.7	10	2.625	1	1.0	N 12° W	1.95	5.20
1854	41.0	0.0	65.1	22.3	42.8	12	2.685	4	2.7	N 50° E	2.57	6.81
1855	42.4	+ 1.4	63.8	12.2	51.6	8	2.030	3	1.6	N 36° W	3.99	7.57
1856	42.3	+ 1.3	69.8	15.1	54.7	13	2.780	3	0.1	N 29° E	1.64	6.05
1857	35.4	— 5.6	51.9	10.0	41.9	10	1.755	11	12.9	N 60° W	4.15	10.24
1858	41.5	+ 0.5	61.5	23.8	37.7	13	1.642	2	0.1	N 14° W	1.64	9.57
1859	39.5	— 1.5	62.1	23.9	38.2	9	2.527	8	1.2	N 36° W	2.33	10.79
1860	39.5	— 1.5	60.7	19.7	41.0	11	1.282	5	0.3	N 37° W	4.10	10.30
1861	42.0	+ 1.0	62.3	26.2	36.1	12	1.619	4	6.9	N 37° E	2.31	8.90
1862	39.6	— 1.4	64.1	20.1	44.0	10	2.235	4	0.2	N 50° E	2.48	9.77
1863	42.0	+ 1.0	67.7	8.9	58.8	8	2.210	4	1.6	N 14° E	3.75	9.20
1864	40.9	— 0.1	58.3	29.5	28.8	16	3.633	3	3.5	N 41° E	3.39	7.77
1865	43.1	+ 2.1	60.5	25.2	35.3	17	3.972	6	2.0	N 84° W	2.11	8.39
1866	43.9	+ 2.9	69.2	29.5	39.7	7	1.675	2	Inp.	N 42° W	3.34	7.95
Results to 1864.	40.96	...	65.57	20.04	45.53	9.7	2.433	3.3	2.40	N 7° W	2.07	8.06
Excess for 1866.	+ 2.90	...	+ 3.63	+ 9.46	— 5.83	— 2.7	— 0.758	— 1.3	— 2.40	....	...	— 0.11

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO CANADA WEST,—MAY, 1866.

Latitude—43 deg. 39.4 min. North: Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 PM.	10 P.M.	Re-sul't.	ME'N		
1	29.474	29.269	29.280	29.3242	36.3	41.7	37.8	39.15	— 7.27	.123	.125	.217	.155	56	46	95	65	N E b N	E N E	Calm.	N 43 E	1.4	14.6	0.0	6.41	10.03	0.075	...
2	.374	.437	.529	.4627	37.0	43.9	37.0	39.73	— 6.98	.183	.130	.149	.153	84	43	67	63	NW b N	N N W	W b N	N 48 W	14.2	21.5	9.0	14.60	15.28	...	...
3	.552	.505	.480	.5078	36.0	47.2	37.0	40.80	— 6.25	.144	.087	.124	.115	68	24	56	47	W N W	W b N	Calm.	N 69 W	1.2	19.0	0.0	10.93	11.05	...	...
4	.456	.406	.441	.4335	39.2	56.5	45.0	47.93	+ 0.52	.147	.118	.149	.135	61	25	49	42	W b N	NW b W	NW b N	N 53 W	3.4	21.6	9.8	12.27	12.97	...	...
5	.466	.481	.579	.5198	38.1	55.8	44.3	46.37	— 1.37	.179	.177	.194	.176	77	38	67	57	N N W	NW b N	NW b N	N 47 W	4.0	16.0	7.4	9.24	11.04	...	...
6	.630	.655	—	—	41.7	57.6	—	—	—	.123	.193	—	—	46	40	—	—	NW b N	N N W	N N W	N 27 W	9.0	17.0	14.7	12.83	13.15	...	...
7	.842	.824	.756	.8020	44.6	52.2	44.3	48.12	— 0.30	.162	.164	.157	.160	54	42	53	48	N	S E b S	Calm.	S 47 E	3.8	7.8	0.0	2.28	2.62	...	...
8	.722	.567	.375	.5353	43.5	53.3	49.0	50.03	+ 1.25	.177	.168	.287	.212	62	41	82	60	Calm.	E N E	N E b E	N 37 E	0.0	5.2	8.6	4.65	6.73	0.270	...
9	.372	.402	.485	.4260	46.8	56.5	49.3	50.52	+ 1.35	.285	.291	.303	.280	89	63	86	76	NW b W	S b W	Calm.	S 69 W	8.5	9.0	0.0	4.29	6.14	...	...
10	.577	.559	.519	.5452	45.0	58.3	46.8	49.78	+ 0.28	.258	.236	.245	.248	86	48	76	70	Calm.	S E b S	E	S 58 E	0.0	7.0	2.6	2.23	3.60	...	...
11	.527	.488	.490	.5067	45.7	67.0	52.6	56.35	+ 6.45	.211	.309	.279	.277	68	47	71	62	Calm.	S E	Calm.	S 66 E	0.0	5.8	0.0	1.36	1.56	...	...
12	.514	.459	.412	.4537	47.2	68.8	63.4	60.62	+10.45	.279	.274	.356	.309	86	38	61	60	S E	S b W	W b S	S 44 W	0.5	16.0	5.4	5.84	9.77	0.165	...
13	.376	.460	—	—	46.1	46.8	—	—	—	.273	.180	—	—	87	55	—	—	NW b N	N W	Calm.	N 41 W	17.0	24.2	0.0	12.24	12.38	0.315	...
14	.662	.657	.658	.6640	38.1	51.5	37.8	43.30	— 7.58	.161	.101	.183	.149	69	26	80	56	Calm.	N W	S S W	N 68 W	0.0	19.6	1.0	3.62	5.29	...	...
15	.610	.419	.282	.4155	38.5	49.7	47.2	46.87	— 4.42	.173	.278	.249	.232	74	77	76	71	S S W	S	S S W	S 14 W	0.5	10.4	10.5	3.23	7.40	0.125	...
16	.383	.571	.626	.5408	43.9	49.0	40.3	43.90	— 7.68	.244	.225	.150	.201	86	65	59	69	N N W	S E	N W	N 1 W	13.6	3.0	2.0	4.35	6.94	...	...
17	.650	.625	.529	.5930	38.1	50.0	42.1	44.37	— 7.62	.153	.173	.152	.169	66	47	56	57	NW b N	E b S	E	S 82 E	5.2	7.5	4.6	5.61	5.79	...	...
18	.469	.383	.422	.4245	44.3	53.3	53.6	51.07	— 1.22	.184	.251	.329	.260	63	61	80	68	E	E	N N E	N 80 E	1.0	11.6	1.2	3.85	5.02	...	...
19	.485	.482	.440	.4627	52.2	63.7	54.4	57.62	+ 5.00	.275	.318	.288	.299	70	54	67	63	N	S E b S	S E b S	S 62 E	3.8	6.0	5.8	2.53	3.73	...	...
20	.425	.246	—	—	53.6	65.9	—	—	—	.297	.437	—	—	72	68	—	—	E	E	NW b W	N 39 W	3.0	7.0	7.8	4.39	10.58	0.180	...
21	.402	.463	.517	.4652	48.6	50.4	43.2	47.03	— 6.28	.202	.142	.198	.170	58	38	70	53	W N W	W N W	W N W	N 60 W	15.5	27.0	10.2	22.03	22.18	inap:	...
22	.583	.617	.640	.6167	40.7	47.5	39.2	42.87	—10.83	.170	.126	.147	.142	66	36	61	52	N W	NW b N	W b N	N 49 W	24.2	28.2	4.4	17.51	17.86	...	...
23	.651	.641	.700	.6623	40.7	51.5	39.9	44.98	— 8.98	.170	.202	.198	.193	66	52	80	64	W N W	W b N	NW b W	N 64 W	12.0	22.4	8.2	13.24	13.70	...	...
24	.696	.589	.490	.5852	41.0	63.7	54.0	54.28	0.00	.167	.133	.180	.150	63	22	42	39	W b N	W S W	W S W	S 72 W	4.0	20.0	8.0	10.43	11.27	...	...
25	.469	.381	.383	.4107	48.2	55.5	48.6	49.98	— 4.70	.216	.274	.222	.231	64	61	64	63	W S W	S S W	NW b W	S 76 W	5.0	10.4	4.0	2.36	4.77	0.090	...
26	.365	.336	.287	.3235	47.2	54.4	51.5	51.80	— 3.18	.202	.287	.263	.260	61	67	68	67	N	E	N E	N 71 E	4.4	9.0	5.0	10.16	10.77	inap.	...
27	.115	28.959	—	—	53.6	51.5	—	—	—	.238	.326	—	—	57	85	—	—	E N E	N E b E	N E b E	N 47 E	20.5	19.0	8.4	12.14	14.73	1.290	...
28	28.950	29.172	.241	.1353	47.2	51.8	47.1	48.33	— 7.32	.279	.271	.250	.260	86	70	77	77	NW b N	N W	W	N 48 W	18.0	28.5	3 2	11.24	11.59	0.085	...
29	29.205	.263	.333	.2677	41.0	50.8	46.8	47.63	— 8.32	.184	.313	.264	.264	71	84	81	79	W	S W	N W	S 84 W	0.5	5.6	6.8	3.70	5.39	0.110	...
30	.317	.255	.353	.3213	46.1	55.5	48.2	50.95	— 5.30	.234	.305	.277	.280	75	69	82	75	W b S	S W	N N W	N 87 W	5.8	7.8	7.8	5.17	7.45	0.115	...
31	.581	.683	.735	.6755	45.5	55.5	47.1	49.63	— 6.92	.233	.262	.212	.233	76	60	65	65	NW b N	S	N b W	N 51 W	8.6	8.2	8.0	2.21	6.42	...	...
M	29.4946	29.4790	29.4808	29.4845	42.99	53.89	46.20	48.30	— 3.18	.200	.213	.223	.212	71	50	69	62	....	....	....	....	6.73	14.06	5.30	......	9.26	2.820	......

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MAY, 1866.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 29.866 at 8 a.m. on 7th. } Monthly range=
Lowest Barometer . . . . 28.919 at 6 p.m. on 27th. } 0.947 inches.

Self-registering Ther.
Maximum temperature . . . 73°.4 on 20th. } Monthly range=
Minimum temperature . . . 33°.4 on 15th. } 40°0
Mean maximum temperature . . 57°55 } Mean daily range=17°76
Mean minimum temperature . . 39°79 }
Greatest daily range . . . . . . 31°8 from a.m. to p.m. of 24th.
Least daily range . . . . 4°8 from a.m. to p.m. of 13th.

Warmest day . . . . 12th ..Mean Temperature . . . 60°62 } Difference=21°.47
Coldest day . . . . . 1st...Mean Temperature . . . 39°15 }

Maximum Radiation { Solar . . . . 117°0 on 11th } Monthly range=
Maximum Radiation { Terrestrial . . . . 21°0 on 17th & 24th } 96°.0

Aurora observed on 7 nights, viz.:—on 3rd, 4th, 6th, 12th, 14th, 18th, and 19th.
Possible to see Aurora on 24 nights; impossible on 7 nights.
Snowing on 00 days; depth 0.0 inches; duration of fall 0.0 hours.
Raining on 13 days; depth 2.820 inches; duration of fall, 60.1 hours.
Mean of cloudiness=0.54; Most cloudy hour observed, 2 p.m; mean=0.67; least cloudy hour observed, 10 p.m.; mean=0.39.

Sums of the Components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
3237.72	902.11	1241.24	3333.46

Resultant direction, N. 46° W.; Resultant Velocity, 4.49 miles per hour.
Mean velocity 9.26 miles per hour.
Maximum velocity 32.3 miles, from 11 a.m. to noon of 21st
Most windy day 21st—Mean velocity 22.18 miles per hour. } Difference 20.62.
Least windy day 11th—Mean velocity 1.56 miles per hour. }

Most windy hour, 3 p.m.—Mean velocity, 14.85 miles per hour. } Difference
Least windy hour, 10 p.m.—Mean velocity, 5.44 miles per hour. } 9.41 miles.

2nd. Thin Ice 6 a.m. 10th. Sharp hoar frost a.m. 14th. Hoar frost. 17th. Hoar frost. 21st. Lightning and Rain during morning. 24th. Hoar frost. 24th. Solar halo.

May, 1866, was cold, dry and windy.

COMPARATIVE TABLE FOR MAY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	53°.8	+ 2.1	74°.5	30°.8	43°.7	9	4.150	0	0.0	...	...	...
1841	50.5	— 1.2	76.2	26.6	49.6	11	2.350	1	...	...	...	0.35 lbs
1842	49.1	— 2.6	74.4	30.0	44.3	7	1.275	0	0.0	...	...	0.53 "
1843	49.1	— 2.6	79.6	28.9	50.7	5	1.570	0	0.0	...	...	0.52 "
1844	53.6	+ 1.9	77.7	29.0	48.7	14	5.670	0	0.0	...	...	0.30 "
1845	49.6	— 2.1	76.6	29.4	47.2	8	2.300	0	0.0	...	...	0.55 "
1846	55.5	+ 3.8	78.1	34.3	43.8	9	4.375	0	0.0	...	...	0.46 "
1847	54.4	+ 2.7	72.5	27.8	44.7	12	2.040	0	0.0	...	...	0.29 "
1848	54.1	+ 2.4	78.5	31.9	46.6	13	2.520	0	0.0	N 40 W	1.31	4.93 ms
1849	48.0	— 3.7	72.5	32.7	39.8	16	5.115	0	0.0	N 51 E	1.97	5.33 "
1850	47.6	— 4.1	76.3	31.1	45.2	7	0.545	1	inap.	N 64 W	2.05	6.32 "
1851	51.3	— 0.4	73.2	28.7	44.5	12	2.950	1	0.5	N 32 W	1.59	6.34 "
1852	51.4	— 0.3	73.3	34.5	38.8	7	1.125	1	inap.	S 82 W	0.99	4.00 "
1853	50.9	— 0.8	78.4	38.4	40.0	17	4.420	1	inap.	N 2 W	0.83	5.16 "
1854	52.2	+ 0.5	69.0	27.6	41.4	11	4.630	0	0.0	E	0.40	5.38 "
1855	53.1	+ 1.4	74.8	33.9	40.9	6	2.565	2	0.9	N 1 W	2.76	5.93 "
1856	50.5	— 1.2	80.1	35.5	44.6	14	4.580	1	inap.	N 4 E	3.99	9.81 "
1857	48.9	— 2.8	72.5	27.9	44.6	15	4.145	1	inap.	N 23 W	1.14	8.13 "
1858	48.9	— 2.8	66.0	35.0	31.0	17	6.367	0	0.0	N 42 E	3.33	9.30 "
1859	55.2	+ 3.5	76.2	41.5	34.7	11	3.410	0	0.0	N 72 E	1.59	5.70 "
1860	55.5	+ 3.8	73.2	35.6	37.6	16	1.815	0	0.0	N 26 E	2.66	7.17 "
1861	47.5	— 4.2	72.0	29.1	42.9	12	3.380	1	0.5	N 47 W	3.60	9.17 "
1862	52.2	+ 0.5	77.8	38.1	39.7	8	1.427	0	0.0	N 52 W	2.80	7.87 "
1863	54.3	+ 2.6	77.1	38.1	39.0	14	3.363	1	0.1	N 56 E	0.41	5.89 "
1864	54.8	+ 3.1	74.2	35.3	38.9	18	4.070	0	0.0	N 7 W	1.86	5.64 "
1865	52.3	+ 0.6	76.0	33.8	42.2	11	4.003	0	0.0	N 3 W	1.65	5.48 "
1866	48.3	— 3.4	68.8	36.0	32.8	13	2.820	0	0.0	N 46 W	4.49	9.26 "
Results to 1864.	51.68	...	74.98	32.47	42.52	11.6	3.206	0.4	0.09	N 6 W	1.46	6.59
Exc. for 1866.	—3.38	...	—6.18	+3.53	—9.72	+1.4	—0.386	—0.4	—0.09	...	...	+2.67

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JUNE, 1866.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17.33 min. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Result't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A. M.	2 P. M.	10 P.M.	Re-sult'.	ME'N		
1	29.812	29.763	29.714	29.7563	40.7°	56.5°	45.4°	49.87°	— 7.08°	.153	.185	.225	.216	60	40	74	60	Calm.	S	Calm.	S 2° W	0.0	4.4	0.0	1.30	2.08	...	...
2	.669	.625	.556	.6122	50.4	59.0	49.7	55.38	— 1.88	.207	.301	.298	.281	56	60	83	64	Calm.	S E b S	Calm.	N 67 E	0.0	1.5	0.0	1.36	2.11	...	...
3	.491	.455	—	—	55.1	63.4	—	—	—	.237	.431	—	—	53	74	—	—	N E	E b N	E N E	N 76 E	2.6	10.0	10.7	9.42	9.43	inap.	...
4	.354	.374	.434	.3872	52.6	60.9	56.2	56.60	— 1.25	.374	.441	.394	.401	94	82	87	87	E b N	E N E	Calm.	N 70 E	6.0	6.6	0.0	4.20	4.23	0.140	...
5	.441	.417	.387	.4097	52.9	65.2	57.6	58.20	+ 0.05	.393	.550	.458	.463	98	88	97	95	E b N	Calm.	Calm.	N 86 E	3.0	0.0	0.0	2.13	2.17	.150	...
6	.360	.257	.267	.2970	52.9	59.8	52.6	55.82	— 2.63	.372	.381	.348	.383	92	74	89	86	Calm.	S S W	S W b S	S 23 W	0.0	11.0	1.2	4.35	5.14	.140	...
7	.332	.402	.472	.4095	58.0	69.2	55.1	60.82	+ 2.07	.441	.380	.375	.391	92	53	86	75	Calm.	W b N	Calm.	N 78 W	0.0	23.8	0.0	10.15	10.22	...	...
8	.534	.535	.583	.5555	58.0	67.0	55.1	60.38	+ 1.32	.382	.460	.375	.396	79	69	86	75	Calm.	S E b E	E	N 88 E	0.0	2.8	10.5	6.44	7.77	...	...
9	.531	.533	.570	.5440	55.8	55.4	58.0	57.30	— 2.18	.365	.349	.452	.395	82	80	94	84	NE b E	S E b E	Calm.	N 89 E	3.8	3.5	0.0	1.53	2.22	...	...
10	.723	.751	—	—	57.6	72.4	—	—	—	.353	.562	—	—	74	70	—	—	NW b W	S b W	N N W	N 40 W	1.5	2.8	8.3	4.20	6.04	...	...
11	.907	.877	.809	.8607	54.0	62.7	52.9	57.45	— 2.53	.250	.296	.274	.282	59	51	69	60	N	S b W	Calm.	S 36 E	9.0	2.5	0.0	0.64	2.12	...	...
12	.793	.705	.585	.6767	55.8	58.7	53.3	55.98	— 4.28	.290	.210	.323	.269	65	42	79	60	E b N	E b N	E b N	N 82 E	3.2	7.0	10.0	9.12	9.13	.710	...
13	.516	.372	.376	.3933	48.6	57.2	60.9	57.13	— 3.45	.322	.427	.503	.424	94	91	94	90	E b N	S b W	Calm.	S 41 E	4.0	1.0	0.0	0.68	1.20	.100	...
14	.339	.345	.396	.3607	61.6	74.6	58.0	65.18	+ 4.35	.428	.287	.337	.348	78	32	70	59	Calm.	W b S	Calm.	S 78 W	0.0	17.0	0.0	6.65	6.85	...	...
15	.331	.374	.380	.3642	60.1	68.8	58.3	64.17	+ 3.03	.376	.310	.345	.330	72	44	70	57	Calm.	W b N	SE b S	S 89 W	0.0	13.0	2.0	6.90	7.32	inap.	...
16	.392	.388	.458	.4178	55.8	66.3	55.8	59.78	— 1.57	.388	.366	.333	.366	87	56	74	72	Calm.	S W b S	Calm.	S 20 W	0.0	5.2	0.0	2.87	3.20	.100	...
17	.470	.427	—	—	55.8	60.1	—	—	—	.400	.375	—	—	90	72	—	—	Calm.	N E b E	N E b N	N 62 E	0.0	3.8	11.4	6.53	7.52	.950	...
18	28.967	.056	.081	.0373	53.6	53.6	50.8	52.60	— 9.35	.384	.298	.294	.332	93	72	78	83	E b S	S b E	S E	S 29 E	8.0	15.0	15.0	10.26	12.77	.245	...
19	29.219	.462	.605	.4558	51.8	62.7	51.1	55.40	— 6.73	.353	.330	.342	.336	92	58	91	78	W N W	W b N	Calm.	N 76 W	10.5	14.2	0.0	7.52	7.60	inap.	...
20	.671	.660	.665	.6633	54.7	72.0	59.1	62.05	— 0.40	.315	.406	.379	.368	73	52	75	67	Calm.	S W b S	SW b W	S 30 W	0.0	9.8	0.3	4.33	4.38	...	...
21	.646	.528	.417	.5243	59.8	75.3	65.5	67.53	+ 4.87	.405	.553	.429	.472	78	63	68	69	Calm.	S b W	S W b S	S 26 W	0.0	12.5	5.8	6.57	6.90	...	...
22	.510	.543	.523	.5245	64.8	74.2	61.9	67.03	+ 4.08	.450	.457	.489	.443	73	54	88	68	W N W	S b W	Calm.	S 45 W	5.5	7.0	0.0	2.85	3.75	...	...
23	.540	.535	.552	.5425	64.5	75.7	64.5	68.75	+ 5.60	.494	.594	.532	.543	81	66	88	78	Calm.	S S W	Calm.	S 26 W	0.0	4.0	0.0	1.34	1.35	...	...
24	.623	.623	—	—	66.3	73.8	—	—	—	.548	.647	—	—	85	78	—	—	Calm.	E S E	Calm.	S 57 E	0.0	4.2	0.0	1.50	1.99	...	...
25	.608	.595	.651	.6328	71.7	89.4	64.8	74.10	+10.55	.661	.699	.476	.583	86	50	77	71	S W b S	W b S	S W	S 61 W	5.4	15.8	5.0	4.81	5.15	inap.	...
26	.594	.490	.412	.4932	65.6	76.4	68.8	68.93	+ 5.05	.478	.694	.557	.557	76	76	79	78	N N E	S	N E	S 15 W	5.0	5.8	2.0	3.02	4.92	.030	...
27	.335	.403	.504	.4263	66.3	70.2	60.1	64.77	+ 0.70	.549	.484	.366	.432	85	66	70	70	N W	S b W	NW b N	N 43 W	9.0	5.2	8.0	5.05	6.71	.130	...
28	.608	.653	.715	.6638	53.6	58.7	52.2	54.37	— 9.92	.297	.339	.234	.278	72	68	60	65	N N W	S S W	NW b N	N 41 W	5.0	5.0	3.5	1.42	4.48	...	...
29	.752	.717	.727	.7317	51.1	60.9	52.6	55.70	— 8.75	.269	.254	.342	.292	71	47	86	67	N N W	S	Calm.	S 22 E	0.5	6.0	0.0	1.69	2.42	.025	...
30	.748	.785	.812	.7935	52.6	65.9	56.2	59.37	— 5.22	.310	.348	.285	.319	78	54	63	63	N E	S b E	Calm.	S 25 E	2.0	2.0	0.0	1.41	1.67	...	...
...	......	......	......	......	......	......	......	......	....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.5196	29.5152	29.5250	29.5205	56.43	66.01	56.79	60.18	— 0.85	.373	.400	.376	.381	80	61	80	72	....	....	....	....	2.80	7.41	3.12	......	5.09	2.720	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JUNE, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 29.907 at 6 a.m. on 11th. } Monthly range=
Lowest Baromoter . . . . 28.967 at 6 a.m. on 18th. } 0.930 inches.

Self-registering Ther.
Maximum Temperature . . . . . . 90°.5 on 25th. } Monthly range=
Minimum Temperature . . . . . . 40°.0 on 1st. } 50°.5
Mean Maximum Temperature . . 69°47 } Mean daily range=18°06
Mean Minimum Temperature . . 51°41 }
Greatest daily range . . . . 28°0 from a.m. to p.m. of 20th.
Least daily range . . . . 8°2 from a.m. to p.m. of 18th.

Warmest day . . . . 25th...Mean Temperature . . . 74°10 } Difference=24°.23
Coldest day . . . . . . 1st ...Mean Temperature . . . 49°87 }
Maximum Radiation. Solar . . . . 134°.0 on 25th } Monthly range=
Terrestrial . . . . 25°.0 on 1st } 109°.0

Aurora observed on 1 night, viz.—12th.
Possible to see Aurora on 19 nights: impossible on 11 nights.
Snowing on days; depth inches; duration of fall hours.
Raining on 15 days; depth 2.720 inches; duration of fall 57.1 hours.
Mean of cloudiness=0.54; most cloudy hour observed, 4 p.m.; mean=0.58; least cloudy hour observed, 10 p.m.; mean=0.49.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
724.54	1218.38	1240.05	1376.19

Resultant Direction, S. 15° W.; Resultant Velocity, 0.71 miles per hour.
Mean Velocity, 5.09 miles per hour.
Maximum Velocity, 27.7 miles, from 2 to 3 a.m. of 18th.
Most windy day, 18th—Mean velocity 12.77 miles per hour. } Difference,
Least windy day, 13th—Mean velocity 1.20 miles per hour. } 11.57 miles
Most windy hour, noon—Mean velocity 8.37 miles per hour. } Difference,
Least windy hour, 3 a.m.—Mean velocity 2.30 miles per hour. } 6.07 miles

4th. Fog at night. 5th. Dense fog a.m. Thunder storm at night. 9th. Solar halo a.m. 12th. Lightning at night. 13th. Thunder storm. 15th. Thunder storm. 16th. Thunder storm. 17th. Foggy. 25th. Very hot day. Thunder storm. 26th. Thunder storm. 29th. Thunder storm.

June 1st. Sharp hoar frost a.m. 22nd. Fire flies numerous. 27th. Pollen of plants fell during the storm this day.

June, 1866, showed little difference from the averages of preceding years.

COMPARATIVE TABLE FOR JUNE.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum observed.	Minimum observed	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	59°.8	— 1°.5	78°.5	37°.1	41°.4	11	4.860	...	...	...	...	...
1841	65.6	+ 4.3	92.8	45.7	47.1	9	1.560	...	...	...	...	0.36 lbs
1842	55.6	— 5.7	73.9	28.0	45.9	15	5.755	...	...	...	...	0.31 "
1843	58.4	— 2.9	81.3	28.5	52.8	12	4.595	...	...	...	...	0.27 "
1844	59.9	— 1.4	82.8	33.1	49.7	9	3.535	...	...	...	...	0.19 "
1845	61.0	— 0.3	83.6	40.9	42.7	11	3.715	...	...	...	...	0.27 "
1846	63.3	+ 2.0	83.3	41.5	41.8	10	1.920	...	...	...	...	0.32 "
1847	58.4	— 2.9	78.3	36.7	41.6	14	2.625	...	...	...	...	0.30 "
1848	62.9	+ 1.6	92.5	38.3	54.2	8	1.810	...	...	N 61 W	1.90	4.51 ms
1849	63.2	+ 1.9	84.9	45.2	39.7	7	2.020	...	...	S 71 E	0.49	3.32 "
1850	64.3	+ 3.0	83.2	49.0	34.2	10	3.345	...	...	S 60 W	0.38	4.54 "
1851	59.2	— 2.1	79.2	41.2	38.0	11	2.695	...	...	S 2 W	1.26	4.42 "
1852	60.8	— 0.5	86.1	43.6	42.5	10	3.160	...	...	S 76 W	1.49	4.09 "
1853	65.5	+ 4.2	86.3	43.3	43.0	9	1.550	...	...	N 1 W	0.10	3.73 "
1854	64.1	+ 2.8	88.7	47.4	41.3	9	1.460	...	...	N 24 E	0.71	4.15 "
1855	59.9	— 1.4	90.7	40.6	50.1	17	4.070	...	...	N 69 W	1.33	5.70 "
1856	62.1	+ 0.8	82.6	48.3	34.3	13	3.200	...	...	S 21 W	0.90	5.30 "
1857	56.9	— 4.4	75.1	40.9	34.2	21	5.060	...	...	N 49 W	1.15	7.60 "
1858	66.2	+ 4.9	86.3	48.7	37.6	12	2.943	...	...	S 20 E	0.25	5.53 "
1859	58.3	— 3.0	85.2	33.9	51.3	16	4.085	2	Inp.	N 77 W	1.95	7.19 "
1860	63.2	+ 1 9	81.1	50.0	31.1	14	2.136	...	...	N 44 W	3.13	7.61 "
1861	61.3	0.0	86.5	48.2	38 3	13	2.329	...	...	N 39 W	2.29	6.11 "
1862	60.5	— 0.8	83.2	44.3	38.9	10	1.007	...	...	N 26 W	1.77	5.98 "
1863	60.1	— 1.2	79.3	45.0	34.3	13	1.662	...	...	N 50 W	2.26	5.24 "
1864	63.0	+ 1.7	92.6	41.7	50.9	5	0.570	...	...	N 55 W	1.72	4.53 "
1865	64.5	+ 3.2	83.2	49.0	34.2	7	2.005	...	...	S 30 W	0.60	4.06 "
1866	60.2	— 1.1	89.4	40.7	48.7	15	2.720	...	...	S 15 W	0.71	5.09 "
Results to 1864.	61.34	...	85.92	41.64	42.28	11.6	2.867	...	...	N 61 W	0.98	5.27
Exc. for 1866.	—1.14	...	+5.48	—0.94	+6.42	+ 3.4	— 0.147	...	...	...	...	— 0.18

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THE

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THE CANADIAN JOURNAL.

NEW SERIES.

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SIR WILLIAM HAMILTON'S PHILOSOPHY: AN EXPOSITION AND CRITICISM.

BY THE REV. J. CLARK MURRAY,

PROFESSOR OF MENTAL AND MORAL PHILOSOPHY, QUEEN'S COLLEGE, KINGSTON.

I. SCOTTISH PHILOSOPHY.

I propose to present in this Journal a series of articles on Sir William Hamilton and his philosophy. Whatever value one may ascribe to the work which Sir William has performed in the world, it cannot be doubted that he is the representative of a very extensive philosophical school at the present day, and that for some time it will be required by friends and foes alike, that that school shall be estimated as it is represented in his writings. The philosophy, of which Hamilton is the most distinguished exponent, he regards as being identical, in its fundamental positions, with that which is known in our histories of philosophy as the *Scottish School*; and it is consequently of importance, if it be not absolutely necessary, in order to the scientific comprehension of Hamilton's philosophy itself, that it should be studied in its relation to the national philosophy of his country, of which it is ostensibly an exposition and defence. I shall accordingly endeavour to give, in the present article, such an outline of the Scottish philosophy in its history and its most prominent characteristics, as seems requisite for the explanation of Sir William Hamilton's speculations; and in doing so, I must of course limit myself exclusively to the most prominent of the problems on which these speculations touch.

The earliest impulse to philosophical speculation is probably to be traced in Scotland, as in most other countries in modern Europe, to the general intellectual revival which mingled, at one time as cause, at another as effect, with the reformation of the church in the 16th century. A powerful influence must have been exerted in the earlier part of the century by John Mair, especially through his opinions on civil and ecclesiastical polity,* which he had probably thought out when, as a student at the University of Paris, he became acquainted with the claims of the Gallican church, and which, it is equally probable, gave a direction to the lives of his pupils, Knox and Buchanan, as well as to the reform which they were the principal means of introducing. But in those departments of philosophy, in which the Scottish school became afterwards famous, Mair attained no emancipation from the traditional forms of thought whose trammels were beginning to be felt throughout Europe; and accordingly when the last quarter of the century opened, it was still an axiom in St. Andrew's, *Absurdum est dicere errasse Aristotelem,* which could not be questioned without a riot,* and the denial of which by the Principal in the University of Glasgow, was sure to excite, in one of the regents, disrespectful manifestations of ill temper.† The Principal of that University at the time was Andrew Melville. Melville had in earlier life attended the lectures of Ramus at the University of Paris, and not only his immediate assault on the dominant Aristotelianism in the Universities of his native country, but his whole teaching, as far as may be gathered from the text books which he introduced,* seems but the natural issue of the stimulus which he had received from the great leader of the revolt against Aristotelian authority in France. The learning and eloquence and argumentative ability, with which Melville led his successful inroad upon the old routine of thought in the Scotch Universities, originated a fresh educational power which had begun to attract even foreigners† to the then remote University of Glasgow; and a more intimate acquaintance with the period will only confirm the impression, that for Scotland a brilliant career in letters was being opened up,* such as her Southern sister had then already commenced, and such as she herself entered upon at once, whenever the cause was removed, which soon after this began to operate, and which rendered such a career impossible for her until she had done a century of other work more essential to her own existence, and also, it is believed, to the progress of civilization in the British islands.

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* For these, see McCrie's *Life of Knox.*

* *Autobiography and Diary of Mr. James Melville*, pp. 123–4.

† Ibid., p. 67.

* Ibid., p. 49.

It is no part of my task in this place to interpret the development of the Scottish mind in the seventeenth century; but even Mr. Buckle explains the limitation of its range during that period, as arising, not from an inherent impotence, but partly from the compulsory imprisonment of external circumstances, partly from the voluntary concentration of its powers on an unwearying revolt against political and ecclesiastical despotism. That such is the true explanation of the narrow space within which the Scottish mind moved during the century in question, becomes apparent from the results which immediately followed the Revolution of 1688. With the peaceful communication, which by this means was opened, between the north and the south of Britain, began that influence of the two nations on each other, which, after a few years, rendered their legislative union possible and which is now welding them into one. The literature of England thus found its way into Scotland, and the literary language of London soon become that of Edinburgh also. The Scotch, able once more to breathe freely, began to look abroad on what other nations had been doing, while they were absorbed in their long struggle for existence and for what was dearer to them than existence itself. Even in theology a freer range of thought was ventured upon: so conservative a churchman as Wodrow did not shrink from acquainting himself with the writings of Tindal and Collins, while he indicates the change which had come over the spirit of the Scottish

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† Ibid., p 50. This work, to which I have referred several times, contains some valuable information regarding the condition of the Scottish Universities during the latter part of the 16th century. The author was a nephew of Andrew Melville, and was the first regent in Scotland who lectured on Aristotle's works, not from Latin translations, but from the original (p. 54.)

* See D. Stewart's *Dissertation*, p. 62, note.

Kirk by his alarm at "the notions getting into the heads of young preachers, that moral duties are preferable to positive, &c."* Already in the earlier years of the century there are not wanting indications of the first beginning of those efforts, which at a later period became more decided, to explain what had been deemed the peculiarities of Christianity in accordance with the natural course of mental and material phenomena. In this reawakening of the nation to questions, which it had been precluded from investigating by the circumstances of its history during the previous century, it was natural that the intensely theological bent, which had been already given to it by these circumstances, should direct its efforts still. It may be owing to this, that, as has been noticed by Cousin,† the most eminent guides of the new intellectual movement were connected professionally with the national church and that the speculations of the Scottish school, especially in moral philosophy, have uniformly shewn the high moral influence of the old presbyterianism, or, as Hamilton has expressed it, have been uniformly opposed to all destructive systems.‡

Meanwhile a change took place in the constitution of the Universities, the influence of which in the impulse given to science and philosophy has never, so far as I am aware, been noticed. This was the institution and endowment of professorships, and the consequent abolition of the practice in accordance with which each regent carried his set of pupils through the studies of the entire curriculum in Arts. The change had in fact to some extent been adopted in the University of Glasgow more than a century before, namely in 1576, under the Principalship of Andrew Melville,§ and was subsequently continued, as well as extended ; || but its advantages were in a large measure annihilated by the circumstance, that the salaries attached to the several professorships were on a graduated scale, and that when, any of the higher became vacant, the occupants of the less lucrative were advanced.** It was not however till the year 1708 that the old system was abandoned in Edinburgh ;†† and the first appointment, under the

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*Wodrow's *Correspondence*, Vol. III, p. 470.

†*Philosophie Ecossaise*, pp. 18–19 (3me. ed.)

‡*Lectures on Metaphysics*, Appendix B. (*c.*)

§*Autobiography and Diary of J. Melville*, p. 54.

||*Reid's Account of the University of Glasgow* in Hamilton's edition of his Works, p. 729.

**Ibid, p. 730.

††Bower's *History of the University of Edinburgh*, Vol. II., pp. 71–2.

new system, to the chair of Moral Philosophy did not take place till 1729, to that of Logic and Metaphysics not till the following year. In Aberdeen the old system was continued even in 1752, when Dr. Reid was elected Professor of *Philosophy* and in discharge of its duties required to teach Mathematics and Physics, as well as Logic and Ethics.*

The first professor appointed under the new system to the chair of Logic and Metaphysics in Edinburgh was Dr. John Stevenson, to whom an honourable place should be assigned among the earlier originators of the philosophical inquiry, which the introduction of that system assisted in advancing. It is not indeed for the contributions which his own speculations have given to the philosophy of Scotland, that he is here brought into prominence; but his influence as a teacher in awakening and unfolding the philosophical spirit in others is spoken of by such pupils as Robertson and Stewart so highly, that one cannot but wish to know more of him than is contained in the slender notices which †have come down to us.

In the same year in which Stevenson entered upon his labours in Edinburgh, a man of greater importance both for the results of his speculations, and for his influence as a philosophical teacher, commenced his career as professor of moral philosophy in the University of Glasgow. Francis Hutcheson is rightly regarded by nearly all historians of philosophy as the true originator of the Scottish School. Undoubtedly his claim to this position is founded in a considerable measure on the influence which he exerted in directing inquiry towards mental phenomena in general; but we shall afterwards see how largely the distinctive doctrine of the Scottish school is indebted to the most prominent doctrine of his system,—the theory of internal senses whose affections furnish the mind with ideas as peculiar and indecomposable as those with which we are furnished by the affections of the external or bodily senses.‡

We are now to trace the course through which speculation was led to the position it assumed in the Scottish school. From the opening of intercourse with England, the Scotch professors seem to have kept their students abreast of the most recent English specula-

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*Stewart's *Account of Reid* in Hamilton's edition of Stewart's Works, Vol. X., p. 253.

†The fullest information about Stevenson that I have met with is in Bower's *History of the University of Edinburgh*, Vol. II., pp. 269-281.

‡See Reid's *Intellectual Powers*, Essay VI., Chap. 2.

tions. The writings of Hobbes and of his immediate antagonists came too soon to produce any appreciable influence in Scotland, or at least their influence was interrupted by that of a work which has created a more prominent epoch in the history of philosophy. It is from Locke's *Essay concerning Human understanding* and the consequences to which its doctrines were reduced by others, that we must trace the most important philosophical systems which have since prevailed in France and Germany, as well as in Britain. During the earlier part of last century the doctrines of the *Essay* formed the basis of the principal philosophical teaching in the Scottish Universities; the abridgement by Bishop Wynne was a favourite text-book, and the *Elements of Logic* by Professor William Duncan of Aberdeen is also a mere summary of Locke.*

But, in the transition from Locke to the speculations of Scotland, we may not omit a philosopher, who has not, indeed, received the same prominent position in our histories of philosophy, because his doctrines are only now exerting their just influence by being only now interpreted correctly, but who appears to me to have at once displayed keener philosophical insight, and attained more nearly the true theory of knowledge, as well as the true theory of existence. In Berkeley's *New Theory of Vision,* which was published in 1709, if it be carefully read, there will be found rising to explicit statement at times an implied theory of perception, not by sight alone, but by all the senses; the theory, in fact, which was more fully explained in the *Principles of Human Knowledge* (1710), and which received its most perfect form in the *Three Dialogues between Hylas and Philonous* (1713). The received interpretation of this theory, which became afterwards prevalent in the Scottish school, regards it as a reduction of Locke's theory to partial scepticism—to scepticism concerning the reality of material things. I cannot but maintain that few, who read the bishop's writings afresh in the light of more recent speculations, will rise from their perusal with any such interpretation of their drift. What the drift of his teaching is, it must require considerable time, in the face of such long-established misapprehension, to explain; still, in the few sentences which the brevity of this sketch allows me for such a purpose, I must endeavour to indicate, at least in general, the meaning I attach to his theory.

To interpret the theory, especially in so far as the interpretation of

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*Veitch's *Memoir of D. Stewart*, p. 25, note.

it depends on the interpretation of the language in which it is delivered, we must go back upon Locke's *Essay*, which determined the terminology and phraseology of philosophical writings for a long time, both in England and in France. The problem of Locke's work, as its title implies, is a scientific explanation of human understanding; and this problem is reduced to the question, What is the origin of human understanding, or, in other words, of human knowledge? In the solution, which the *Essay* gives, of this problem, human knowledge is explained as originated exclusively by the action of the phenomena which are presented to the mind from the period of birth onwards, none of these phenomena being admitted to have had any prior existence involved in the nature of the mind. Now, the phenomena which are presented in human knowledge, and which, therefore, form the immediate objects of the mind when it knows, Locke named *ideas*.* It will thus be seen how the problem of the Essay came to be expressed in the question, What is the origin of our ideas? and this became the form in which the problem of philosophy continued to be studied in the school of Locke. It is not necessary here even to touch upon the detailed analysis of our ideas, into which the *Essay* enters with the view of vindicating its theory regarding their origin; but it is necessary to notice the fact, that ideas, or the immediate objects of knowledge, though, of course, *existing as ideas*, are still regarded as only in some way revealing to us *real existence* which can never itself be known. Now, in the light of this philosophy and its phraseology, the doctrine of Berkeley must be recognised as bearing a very different significance from that which is usually ascribed to it. There are, at least, three points in his doctrine, which I am confident that an examination of the *Dialogues between Hylas and Philonous* will confirm at every page.

1. Berkeley maintained the common belief of men, that sensible things, that is, the things which form the immediate objects of perception, really exist, and are not, as most of philosophers maintain, merely images of a real world, which we do not and cannot perceive.

2. But the question with Berkeley is strictly not whether sensible things really exist, or not; but what is meant by saying that they exist really? Now, according to the common doctrine of philosophers, which Berkeley combats, the real existence, which we ascribe to the material universe, is predicable not of the things which we

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* See *Essay*, Book II., chap. 1, sec. 1.

know by the senses, but only of a material substance, which these things represent, though, in itself, it can never be known by the senses or by any other means. These things, however, which we know by the senses, but which merely represent to us real existence, were, as we have already seen, called *ideas* in the philosophy prevalent at Berkeley's time; yet, in spite of this unfortunate fact, it is not difficult to arrive at the conclusion that, regarding the reality of his opposition to the theory of representative perception, there is not a shadow of the doubt from which Sir William Hamilton acknowledges himself unable to clear the language of Reid. "These ideas, as you call them," his language repeatedly and explicitly insists, "these things which we see and touch, you may call them by whatever name you please, are not mere images; they are not the mere show of a world, but the real material world itself, and the only material world that really exists: for that unknown, and unknowable, and unthinkable world, of which you say the world we know is but a phantasm—it is that world which is a phantasm; the result of your own fantastic speculations, with which you puzzle yourselves and your followers." Berkeley, therefore, does not seek to explain the material world, which we know, by supposing the existence of another world, about which we know and can know nothing.

3. What, then, is the explanation which Berkeley gives of the existence which we attribute to material things? According to him, since a thing exists for us only inasmuch as we know it, its very existence, so far as we are concerned, consists in our knowledge of it. The existence of anything independent on me must, therefore, he concludes, be merely the fact that it is known by some other mind; and, consequently, the material universe, as it does not depend for its existence on human, finite minds, must be known by an Universal and Everlasting Mind.

Berkeley brings us, naturally, to the speculations of the Scottish school, not merely because it was necessary to go back upon him to find the originating influence of these speculations, but also because we must go to Scotland to follow the history of the Berkeleyan philosophy. It is fortunate that Dugald Stewart has preserved to us, on the authority of his teacher, Professor Stevenson, the most valuable evidence we possess of the extent to which the doctrines of Berkeley were studied, and studied sympathisingly, among his younger contemporaries in Scotland. The evidence, to which I refer, is the fact, that a number of young men in Edinburgh had formed a club for the purpose of studying Berkeley's writings, that they had corresponded with him in order to obtain further explanations regarding his theory, and that he had spoken of them as evincing a more intelligent comprehension of his argument than he had met with anywhere else.* The only person, whom Stewart mentions as having been a member of the club, is the Rev. Dr. Wallace, who is well-known as one of the earliest writers on the theory of population, and is still remembered, in the church of his native country, for the wise application of his economical studies in the origination of the Scottish Ministers' Widows' and Orphans' Fund. While this was going on in the capital, traces more distinct may be discovered of the influence which the Irish bishop's writings were exerting in other parts of the country.

Two or three years before Hutcheson had begun his career as professor in Glasgow, a younger son in the family of the Humes (or Homes), of Ninewells, in Berwickshire, though scarcely over sixteen years of age,† was schooling himself into habits of speculative thought, by which he was to create a new era in the philosophy of Europe. After abandoning, from disinclination, the study of law, and trying, for a few months, a mercantile life in Bristol, he ultimately retired, for about three years, to Rheims, and afterwards to La Fleche, in Anjou, with the view of devoting himself entirely to philosophical and literary pursuits. While he was still but twenty-six years of age, he returned to London, with the *Treatise of Human Nature* ready to be put into the printer's hands. Though the doctrines of the Treatise were afterwards recast and its author objects to their being judged in their earlier form,‡ there can be no doubt it is in this form that they have acquired historical importance and are, therefore, to be considered at present. Moreover, I know none who have not felt disappointment on turning from the Treatise to its revision—none who have not found in the former, rather than in the latter, the power which has revolutionised the speculative opinions of modern Europe.

Hume starts with the same question, with which Locke's *Essay* is mainly occupied, "What is the origin of ideas?" § Hume's answer is, also, in the main, identical with that of Locke; but the conclusions which he draws with regard to our most important ideas, as well as with regard to the nature of ideas in general, from his analysis of their origin, diverge as widely as is conceivable from the conclusions of the corresponding analysis in the *Essay Concerning Human Understanding.* Setting out with the theory, that all ideas originate in the experience of each human organism from the commencement of its existence, or at least from the commencement of the consciousness associated with it, he refuses to recognise in any idea a single element which cannot be traced to this origin; and there is no belief exalted to so lofty a height in human reverence, that he fears to direct against it the assaults which logically issue from his theory, nor does he weary in piling argument upon argument if he hopes to succeed in dethroning it from the eminence which he believes it to have usurped. There was much in the character of the man who undertook this Titanic task, which qualified him for carrying it out. The retirement of his early life, and the thoughts with which his early studies constantly occupied his mind, combined probably with the peculiarities of his physical temperament* to create in his very boyhood a wish to "fortify himself with reflections against death, and poverty, and shame, and all the other calamities of life;"† and the result of this may be observed in an inability to appreciate the passionate enthusiasm which has carried many to their noblest deeds, as well as in a distaste, if not an incapacity, for those feverish longings and endeavours which trouble the lives of men who are driven into the struggle of human existence by the tyranny of external circumstances or by the equally resistless tyranny of nervous irritability. With all this there was a native kindliness of disposition, a humility under his own speculative convictions regarding the littleness of human reason and its liability to error, which produced in him such an indifference to varieties of opinion, such an absence of pugnacious dogmatism and even such generosity towards antagonists,‡ as have been reached by few. When such a character was united to an intellect which saw from afar the dim terminations in which all lines of thought inevitably end, which untied with delicate touch the most complicated knots of speculation,

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* Stewart's *Dissertation*, pp. 350-1 (Hamilton's edition).

† See the Letter to Michael Ramsay, in Burton's *Life and Correspondence of D. Hume*, Vol. I., pp, 12-16.

‡ See Advertisement to his *Inquiry Concerning Human Understanding.*

§ See the *Treatise*, Book I., Chap. I., Sect. 1.; and the *Inquiry*, Sect. 2.

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*See the remarkable letter to a physician in Burton's *Life and Correspondence of D. Hume*, Vol. I., pp. 30–38.

† Ibid.

*See his letter to Reid, with Reid's reply, in Burton's *Life and Correspondence of D. Hume*, Vol. II., pp. 153–6.

which wrought into luminous language the most intractable eccentricities of scepticism, we can understand how the farthest and fullest consequences of the doctrine which traces all ideas to experience were unfolded with a consistency which was deterred by no consideration of human interests, whether esteemed to be petty or lofty alike.

There is of course much in Hume's, as in every creative mind, the origin of which the most elaborate investigation into the circumstances of his life leaves us unable to trace; still it is impossible to avoid recognising the influence of the philosopher who has been mentioned immediately before him and whom we know to have been a power among the thinking young men of Scotland while Hume was still a young man. The evidence, which the *Treatise of Human Nature* contains, of the general "impression that Berkeley's writings left upon Hume," has been noticed by Dugald Stewart;* and we are now to see that the bishop's philosophy furnishes a point of transition to that of the sceptic. The theory of the former, which ascribes real existence to the sensible objects or "ideas" that are immediately presented to the mind, and denies that they represent any unknown and unknowable substance, is adopted likewise by the latter; but whenever they come to define what is implied in *existence,* they diverge into two theories of the universe as hopelessly irreconcilable as could be conceived. For while the bishop maintains that the natural belief in the existence of things, independently of their being perceived by our minds is valid, and explains that as being an existence in the Eternal and Universal Mind who knows all things, one of the most elaborately finished sections† in the whole of the *Treatise* is occupied with an effort to prove that the belief is altogether illusory and to explain the origin of the illusion.

This divergence in the interpretation, which the two speculations severally give to the existence of matter, arose from another difference which reveals more fully the thorough consistency at which Hume unshrinkingly aimed. If *matter* is but a system of "ideas" which have no existence beyond the mind that perceives them, what must follow with regard to *mind?* Is it also "only a system of floating ideas without any substance to support them?" Berkeley was too acute not to see, too honest not to face this question;‡ and his answer is well worthy of consideration by those who would comprehend his theory. To Hume the same problem presented itself, but met with a very different solution. According to his theory regarding the origin of mental phenomena, these are all, to use his own language, either *impressions* or *ideas,* or, to use language which he might have adopted if he had not been too timid in departing from that of ordinary literature, *presentations* or *representations.* Still further, according to that theory, our representations can never contain any element which has not been first given in a presentation; and therefore any idea or representation which we form of existence must be derived from some impression or presentation. But there is no presentation of existence as an object of knowledge, uniformly accompanying the presentation of those objects to which we attribute existence; and consequently, "the idea of existence is the very same with the idea of what we conceive to be existent. Any idea, therefore, we please to form is the idea of a being, and the idea of a being is any idea we please to form." Accordingly, "we can never conceive any kind of existence, but those perceptions which have appeared within the narrow compass of our own minds."* But our minds themselves? It is evident that "what we call a *mind* is nothing but a heap or collection of different perceptions, united together by certain relations, and supposed, though falsely, to be endowed with a perfect simplicity and identity."† I shall not here anticipate a criticism that will more appropriately arise at a subsequent part of these discussions, when we shall find the similarity between the theory of Hume and the latest form of empiricism in their explanation of all known existence as a series of presentations and representations.

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* *Dissertation,* p. 351 (Hamilton's Edition.)

†Book I, chap. 4, sect 2. Cf., Book I., chap. 2, sect. 6.

‡See the third Dialogue in Wright's edition of his works, Vol. I., pp. 203-4. My references are all to this edition.

When the *Treatise of Human Nature* appeared in 1739, Thomas Reid, who was a year older than Hume, had been already two years a clergyman of the Scotch church in the parish of New Machar in Aberdeenshire. Descended on the father's side from a family, which for some generations had been distinguished in the literature and in the learned professions, especially in the church, of Scotland; on the mother's side, a nephew of David Gregory, the celebrated Savilian professor of Astronomy at Oxford and personal friend of Sir Isaac Newton, Reid continued to follow his ancestral scientific tastes with the modesty, with the reverence for traditional modes of thought and life, which one should expect in the character of a conscientious and benevolent country clergyman. This is not the place to attempt a mediation between the opposite extremes in the estimate of Reid, which have been maintained even in recent times by Hamilton and Cousin on the one hand, by Ferrier and Buckle on the other. In his quiet observation of such phenomena as his range of inquiry brought within his reach, in his unpretending classifications of such as he observed, in his timid groping after inferences which his observations seemed to legitimate, there was no danger of falling into those extravagancies in which the flights of genius are doomed to land, often, like that of Icarus, from the very height to which they rise; but he would probably have accepted, as but a dubious compliment, the ascription to him of those sublime anticipations, which direct the labours of subsequent inquirers till they are established in literal accordance with the rules of scientific induction.*

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* *Treatise*, Book I., Chap. 2, Sec. 6.

†Ibid, Book I., Chap. 4., Sec. 2.

Dr. Reid, in a well known letter to Dr. Gregory, (20th August, 1790), acknowledges that the discovery of the fundamental and distinctive principle of his philosophy was owing more to Berkeley and Hume than to himself.† From the evidence already adduced of the influence which Berkeley's writings had exerted in Scotland while Reid was still a young man, we are not surprised to learn, as we do from the philosopher himself,‡ that he had at one time adopted the whole of the idealist's theory. According to the same account, it was not till the conclusions of Hume's *Treatise*, "which gave him more uneasiness than the want of a material world," were seen to follow inevitably from the principle on which idealism is built, that he was arrested to question whether that principle is not an unfounded hypothesis.§ The principle referred to is that which Reid supposed to be the universal opinion of philosophers, that "the only objects of thought are *ideas* or *images in the mind*;" and he claims for himself nothing that is strictly his own in philosophy, except his having called this hypothesis in question.* We shall have to consider immediately whether Reid was correct in selecting this as the fundamental peculiarity of his philosophy; but there will be seen to be little

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*See *Intellectual Powers*, Essay I., Chap. 3.

†Stewart's *Account of Reid*, p. 22, a (Hamilton's edition of Reid's Works.)

‡Works, p. 283.

§See the above mentioned letter to Dr. Gregory.

room for doubt, that he is mistaken in supposing the doctrine selected to be distinctive of his system even among those of which he intended his own to be a critique, or that, except in one aspect, it is distinguishable from the doctrine of Berkeley, against which he believed it to contain a successful polemic.

To explain, it must be observed that the doctrine referred to may be regarded both as a theory of knowledge and as a theory of existence. As a theory of knowledge, it maintains that the immediate objects of perception are not mere "ideas or images in the mind" of objects that exist really or out of the mind, but these really existent objects themselves. The *Three Dialogues* of Berkeley, however, maintain exactly the same theory in the different language enforced by their different point of view. For the idealist denominates the immediate objects of perception by the term current among philosophers; the realist, by the term current among ordinary men, or in the language of *common sense.* But the idealist himself acknowledges the revolt of natural feeling against his theory, arising from the awkwardness enforced by the technical language of philosophers, which obliged him to speak of the immediate objects of perception as *ideas*, and not as *things;* * and the statement, that the immediate objects of perception are not the mere images of an unknown existence, but exist really themselves, would undoubtedly have been accepted by both philosophers, as expressing their theory of knowledge in contradistinction from the theories which they opposed.

Though the doctrine of Berkeley and that of Reid, considered as theories of knowledge, may thus be regarded as coincident, as theories of existence they appear, at first thought, to diverge in widely opposite directions; but it is impossible, on second thought, to say how far this apparent divergence would have been found to be real, if the true meaning of Berkeley had been explained to Reid. For I can find no evidence that Reid had ever clearly proposed to himself the question, in answering which his doctrine seems to diverge from that of Berkeley. His polemic against Berkeley consists mainly in an appeal to the natural and necessary belief of mankind, that the objects which we perceive exist really—that they exist beyond the mind which perceives them; but we have already seen that the credibility of that belief is asserted quite as unmistakably by Berkeley—that he only refuses to accept it without a scientific explanation of its meaning. His explanation, as we have further seen, is that the belief in the real existence of the objects of perception is only the belief that they are really perceived, and that the belief in their existence beyond our minds, is simply the belief that they are perceived by another mind, or by other minds: their existence, therefore, according to him, consists in the perception of them by some mind; and he is consequently content to speak of them as *ideas*, which have no existence but *in* a mind. It is difficult to explain the shock which this language created among Berkeley's antagonists, except by supposing that they understood the preposition *in* as expressing some kind of relation in place; it is more difficult to conceive what mental fact they understood it to denote, and most difficult of all to believe that they had paid any attention to his own explanation, in accordance with which *to exist in a mind* and *to be known by a mind* are convertible phrases.* If this explanation had been noticed by Reid, it is scarcely possible to believe that he could have placed himself in the unmitigated antagonism, which he assumed, towards Berkeley; for the faith in a Primordial and Universal Mind involves the admission that nothing exists which is not also known, or, in other words, that everything exists in that Mind. Does the hostility between Berkeley and Reid thus resolve itself wholly into a difference about the meaning of words? There still remains one point at which the two doctrines seem to come into distinct collision; for, while the Scottish philosopher regards the material objects presented to the senses as being the qualities of a substance which is not known by us,† but is, of course, known by the Omniscient, the Irish philosopher protests against the hypothesis of such an unknown substance, as not only unnecessary to explain the phenomena of knowledge, but as contradicting its essential conditions.

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* Berkeley's Works, Vol. I., p. 205.

I have already hinted the possibility of a doubt whether Reid has hit upon the really fundamental principle of his philosophy, when he elevates to that position his discovery, that the theory of perception by means of ideas is without any ground in fact. I believe the historian of philosophy must decide that such a principle should be recognised in Reid's antagonism, not to the "ideal theory," as he calls it, but to the empirical theory regarding the origin of knowledge. Whatever opinion may be formed of his opposition to the latter theory, it is that which distinguishes his place in the development of British speculation and gives his philosophy an importance it never could have derived from the principle which he regarded as its distinctive peculiarity. For as the growth of philosophical speculation unfolds into clearer prominence the real meaning of the problems which it has to solve, it will be found that the conclusions of philosophers regarding the principle involved in the "ideal theory" must depend on their conclusions regarding the origin of our knowledge. There is not here space for an explanation and proof of the above statement; but it may be sufficient in the present connection to notice the fact, that in disproving the "ideal theory" Reid himself is obliged to adduce beliefs which he regards as originated by the very constitution of our minds, and as therefore having an origin prior to experience. It is in this connection that the doctrine of Hutcheson, with regard to internal senses, assumes historical importance as having possibly suggested the general name of *common sense* for the source of those beliefs which are common to all mankind and are considered capable of explanation only as original and compulsory issues of intelligence. Moreover the statement I have made regarding the actual fundamental principle of Reid acquires additional confirmation, from the fact that the Scottish philosophy, of which he is regarded as the chief representative, is, when named after its distinctive characteristic, usually designated *the philosophy of common sense.*

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* Works, Vol. I. p. 204.

† *Intellectual Powers*, Essay II., chap. 19.

While a correct historical estimate of Reid's philosophy thus seems forced to raise into special prominence his assertion, for some of the elements which constitute human knowledge, of an existence independent on experience, it is scarcely possible to avoid surprise at the slender grasp with which he holds this principle and the unskilful manner in which he applies it in his explanation of the mental phenomena. This may indeed be partly accounted for by the fact, already mentioned, that he was ignorant of the prominence due to this doctrine of his system; but it also arose from his never having clearly apprehended any criterion, by which the *a priori* facts in consciousness could be readily recognised. For although Sir William Hamilton gives Reid the credit of having discovered such a criterion of these facts in their *necessity*,* yet not only are Reid's references to this characteristic so incidental as to afford no ground for believing that he recognised it as *the* criterion, but his doctrine of first principles is such as must have led him to deny that necessity is their differentiating attribute. A brief glance at this doctrine may not be useless in enabling us more correctly to interpret the philosophy of Reid.

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* *Reid's Works*, p. 323 *a*, note; and *Lectures on Metaphysics* Vol. II, p. 359.

According to this doctrine,† *first principles* are those which all reasoning in the last appeal implies, inasmuch as the inference of one truth from another cannot have proceeded without a beginning, but must have started from some truth or truths which are not themselves inferred from any prior truth. Such truths, as being prior to all others in human knowledge, are called *first* principles; and since they do not draw their evidence from others, must contain it in themselves. *Self-evidence* is therefore the distinctive characteristic of first principles. There is, however, a difference of opinion among men, as to what truths are self-evident, and accordingly it is necessary to inquire whether there is "no mark or criterion by which first principles that are truly such may be distinguished from those that assume the character without a just title." In answering the question which he thus proposes, we should certainly expect to find what Reid considered to be *the* criterion of first principles; and yet, in the four propositions with their corollaries which form his answer, while there is an enumeration of several tests, some of which are most inapplicable, there is no mention of the criterion which is now recognized. The only passages in which this criterion is explicitly referred to, as far as I can recollect and as far as Sir William Hamilton quotes, are at pp. 455, 459 and 521 in his edition of Reid's works, where, among other evidences, necessity is adduced as proving the non-empirical character of the two principles, that every beginning of existence must have a cause, and that intelligence in the cause may be inferred from the marks of it in the effect. In these passages undoubtedly Reid sees that a proposition, which we know to be true *necessarily*, and therefore true in all places and at all times, cannot be obtained by an induction, however extensive, of our experiences; but waiving the consideration that he here mis-states a subjective necessity of knowledge as the knowledge of an objective necessity, we must notice, what does not seem to be observed by Hamilton, that Reid's classification of first principles is sufficient to shew that he would have refused to constitute necessity the criterion of them all. For he divides truths into the two classes of *contingent* and *necessary*, while he allocates to each of these a separate set of first principles.* Among the first principles of the latter, he enumerates the two which have just been mentioned; and it is not because they are first principles, it is because they are not contingent, but necessary truths, that he regards them as transcending experience.

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† *Intellectual Powers*, Essay VI., Chapters 4–7.

With this doctrine of first principles, it is not to be wondered that Reid has been so unsuccessful in what ought to have been the most prominent excellence of his system. We have probably in this an explanation of the circumstance, that, although he recognises the importance of an accurate system of the facts which are primal in human knowledge, his detail of them, especially when compared with their exhibition in Kant's *Critique*, appears rather an enumeration at random than even an attempt at systematic classification. It is further remarkable, as possibly traceable to the same source, that, although the analysis of the idea of cause in the *Treatise of Human Nature* led him to the theory of its *a priori* character, he failed to see the conclusion which his own principles should have inferred from the analysis in the same work of the ideas of space and time.

In Reid is included all that is distinctive of Scottish metaphysical philosophy previous to Hamilton. We have indeed contributions of various value from others: in the writings of Dugald Stewart, the whole field traversed in the works of Reid, as well as numerous collateral departments of interest and importance, is illustrated with more elaborate fulness, with the elegance of a wider and more refined æsthetic culture, with a superior command of the English language, and an infinitely superior erudition, if not with a more comprehensive grasp of principles, or any bolder originality in their application; but we have no considerable addition to the substance, no new trait in the character of the philosophy.

We are now better prepared for understanding the exact point at which Sir William Hamilton found the philosophy of his country and the nature of the task which was laid before him. In my next article I shall give an exposition of Sir William's own system; and I shall thereafter proceed to estimate his success in solving the problems which he took in hand.

**Intellectual Powers*, Essay VI., Chapters 5–6.

ON THE VAGARIES OF MEDICINE.

BY C. B. HALL, M.D.

(*Read before the Canadian Institute*).

Mr. President,—In the investigation of any scientific question, our judgment is not to be formed from the number of its advocates, or the individual opinion of its respective supporters, but from the views emanating from the few experimenters and investigators who are acknowledged lights in their particular sphere.

You cannot name the whole range of Animated Nature, without alluding to Buffon and Cuvier, calling on the way upon poor Goldsmith.

In the vast field of Palæontology you recognise an Agassiz, Owen, Buckland, Richardson, and a few others. The Geologist knows Murchison, Ramsay, Lyell and Logan, and remembers with sad reverence the name of Hugh Miller. Numerically, how meagre seem these names to the countless thousands who, in every part of the world, are prosecuting with unyielding ardour these delightful and most useful studies, gathering, as it were, particles of matter from every clime, ascending with a Humboldt to the mountain peak, or diving with a Wallich to the bottom of the sea; but like the streams that pour their ceaseless torrents, never get their full nourishment and strength until they mingle with the ocean's depths. Thus has it ever been with the Science of Medicine—from its earliest record, there have been, through each succeeding era, certain gifted spirits who have ruled its destinies; culling from every busy theorist such parts as bore the test of experience, and rejecting all others—moulding and fashioning, in their proper places, such as fitly joined, and thus keeping together a series of connected truths from the days of Hippocrates to our own.

The early history shows nothing remarkable, other than the ordinary pursuits of learning. We read of each distinguished physician having his class of pupils, and we are told that in two of the schools founded by rival pupils of Pythagoras, human dissection was practised, and whether true or not, leaving the impression that it was upon the living subject. But the first account of any great numbers was in the College of Bagdad, when about the eighth and ninth century there were generally a thousand regular attendants. From this date, as did all learning, the practice of medicine fell into the hands of Monks, who did not add much to its advancement, but retained their hold upon the public mind to a comparatively modern date. In the latter part of the 15th century, when we find the first notice of the most intricate disease as well as the most revolting to humanity—so close was the alliance with these Reverend Gentlemen, (either as prescribers or patients) that the writers of the day gave it the name of Rheume Ecclesiastique. Not to trouble you with the names of such impostors as Valentine Greateacre, who astonished the London world about the middle of the 16th century with his wonderful cures, but which, in more modern times, was called Mesmerism, I will only allude to a few of the vagaries with which science-proper has had to contend. My object being to call your attention to the fact that the Science of Medicine has descended in an unbroken chain, from the earliest ages to our own, separate from the absurdities foisted upon it, receiving in each era additional links or more firm welding, and were I able, like a modern Plutarch, to parallel the other sciences, would be constrained to show the picture much to the advantage of medicine.

As now, so of yore, men sought for specifics, some single principle upon which all cure was to rest—the Alchymist in his universal solvent, 'till a more wise made the grand discovery—that if successful they would have nothing to keep it in. The first great principle was Vitality, its source, power, and influence, but as this was associated as much with Philosophy as Medicine, I need give it only a passing notice.

Phlogiston or Caloric, the principle of heat, was the life-giving power at one time, and many and curious too, were the expedients proposed to impart and regulate its influence as a sole curative. Oxygen, in the last century, claimed a higher state, no less than the source of the former and its vitality.

In like manner Magnetism yielded its place to modern Electricity, which, with all its boasted power of giving life to inanimate objects, must, with its twin sister Spiritualism, yield to the ever-existing truth, that life is solely the gift of the Creator, and goes back to its giver when the created resolves into its elements.

Long and tiresome were the disputes on the classification of disease, which in time were reduced to the synoptic and systematic—the first being dogmatic, and biased by the peculiar mind of each writer, at last gave way to the latter, which, arranged, and re-arranged, according to discoveries of different periods, is now acknowledged by the profession proper.

Brown, a man of great learning, sustained for several years the Brunonian System, wherein medicines were to act according to their degrees of stimulating or exciting. To this followed the Italian system of stimulants and their opposite—depletants or stimulants and counter stimulants.

Brosseau reduced all diseases to inflammation of the stomach and bowels, or Gastro-enterite, and adopted to a great extent this theory of treatment.

Dickson proved, to his own satisfaction, that all changes are periodic, or as Shakespeare makes his victims of the Pontine Marshes say,—"they're all alike the ague."

And Muller, to this day, denies any variation from the normal, to other than chemical causes. A few wonderful means of cure may not be without interest. Cholera received the name of St. Vitus' Dance from the habit of its victims resorting to the Chapel of St. Vitus, in Germany, and dancing away the complaint—it was necessary to keep up the dance 'till the disease gave way or the patient fell from exhaustion. *One woman danced for a month!* "And frequently it was required to hire musicians to play in rotation, as well as various strong sturdy companions to dance with the patients till they could stir neither hand nor foot." So efficacious was flagellation for certain ailments, that it has been suggested as the origin of the physicians cane. We read that "this process was employed to cure Octavius Augustus of Sciatica." Another believes "it has the same effect as Colocynth administered internally." Galen recommended it as a general restorative; others for nervous irritability. One of Queen Elizabeth's physicians found great success in herbs; he says, "with daisy-tea I did recover one Belliser, not only from a spice of Palsie, but also from a quartan ague"—and to show "man's inhumanity to man," he adds, "and afterwards this same Belliser, more unnatural than a viper, sought divers ways to have murdered me, taking part against me with my mortal enemies, accompanied with bloody ruffians for that bloody purpose."

Success did not always attend merit. Sir I. Brown, one of the first physicians who received the honor of knighthood says, "when he commenced his career, he had twenty remedies for one disease, but at the close he had twenty diseases for one remedy."

Scarpa, a distinguished surgeon, says he destroyed a hat full of eyes before he was successful in the operation for cataract; and Dr. Lettsom was satirized for some of his remarks in the *Gentleman's Magazine*, by setting his name to doggrel verse:

"When patients comes to I,
I physics, bleeds, and sweats 'em,
Then, if they choose to die,
What's that to I? (I Letts 'em.")

Though a few men of real worth have been subject to uncalled-for strictures, the profession may be safely said to have held its high position throughout the most of its history. Lady Mary Montagu said-"air, exercise, and company, are the best medicines, and physic and retirement good for nothing but to break hearts and destroy constitutions." And you all remember Macbeth's contemptuous remark to his physician :—

"Can'st thou not minister to a mind diseased;
Pluck from the memory a rooted sorrow;
Raze out the written troubles of the brain,
And with some sweet oblivious antidote,
Cleanse the stuff'd bosom of that perilous stuff
Which weighs upon the heart?
Then—Throw physic to the dogs, I'll none of it."

There have been four great divisions, called the four pathæ, which have been charged upon the profession, but to which they plead not guilty, though each has been acknowledged as having great merits in the cure of different complaints. The first is called the Antipathia, and consists in employing medicines of an opposite effect to the tendency of the disease, having for its motto—"contraria contraribus opponenda," and in all cases giving purgatives for constipation, astringents for looseness, and opium for pain. Though this principle acts correctly in many cases, the profession reject it as unsound, because there are instances in which the opposite would be indicated.

The next is called Allopathia, having for its principle the creating another disease, counter to the one treated—their motto "Ubi irritatio ibi fluxus;" consequently their remedies were called counter-irritants or blisters &c., or such as excited the action of an organ functionally opposed to the diseased, as irritating the stomach to cure inflamation of the throat. By this theory is often produced the curative effect of mercury, the discharge from the salivary glands serving to carry off the over-wrought action of the liver. An interesting case is recorded of an old-standing jaundice being cured in a few days by a suddenly produced ptyalism, the discharge from the salivary glands being of a yellowish brown color, resembling bile, and of a bitter taste. Numerous as are the favorable results of this practice, the profession deny the theory, because it is found efficacious in certain cases, in others it is no good. As the discharge from a blistered surface will not diminish the discharge from an inflamed eye, or remove the excessive secretions in dropsy, the principle is recognized as an adjunct, but rejected as a theory.

The third, Homœopathia has had its rage and struggled hard for supremacy, but its benefits are found too circumscribed for general principles. In this medicines are selected as curatives which would produce similar effects in the normal state, hence "Similia similibus curantur." Like the two preceeding, this theory was known to the ancients, and by some carried to great length. Aristotle prescribed "a hair of the dog that bit you" as a preventive of madness, a now established maxim, and followed faithfully as an antidote for a quite different species of hydrophobia. The two most interesting points in this are the principle of infinitesimal doses recently propounded by Hahneman in Germany, and their being carried along the nervous filaments into the substance of the brain, as stated by Jahr of Paris, who appears to the former what Spurtzeim was to Gall, the philosophiser of his dogma. He asserts positively that in this way melancholy, grief—a cacoethes scribendi,—particularly for poetry, and the more fatal malady of love, have each their globule and each globule is a charm. There have been some cases of lesion of the brain causing a marked change in the person's mind without any subsequent malady. Bœrhaave describes a poet of his time, who, after recovery from an injury of the kind, lost the art and denied his former offspring.

The Reports of one of the London hospitals mention a Welshman twenty-five years of age, who had lived in England for twenty years and spoken their language. After a protracted disease of the brain he could only speak Welsh. I had, myself, the case of a boy five years old, who lost two ounces of the substance of the brain from the kick of a horse—previous to the injury he was unable to speak correctly, and had nicknames for his brothers and sisters. After three weeks quietude he recovered, and to the surprise of his parents spoke distinctly, calling each person by their proper name. On the other hand it is said these results may have happened without any injury to the brain, but were simply suspended memory from rest. The dependence upon a too minute attenuation is discharged by that modern Paul

Pry of nature, the microscope, which detects when the division of particles of gold and sulphur have been carried to their utmost limit, showing particles of mineral in some of the globules and *none in others.*

Like the others it is very good at times, but never can be called a science. It may relieve headache in the morning by taking (as compared with former potations) an infinitesimal dose of the cause of disease, but it can never cure *delirium tremens!* And, besides, I quote from Vol. 15 of the "Medical Gazette," "Homœopathia has been fairly put to the test of experiment by some of the members of the Academy of Medicine in Paris, and the result was a failure. Andral tried it on 130 or 140 patients, in the presence of the homœopathists themselves, adopting every requisite care and precaution; yet, in not one instance was he successful." However, one credit we must award it, and that is—the harmless sugar globules have been the means of stopping the excessive use of those patent medicines that flooded the country, many of them of a most dangerous kind, and I fancy it is generally a transition of patient from one to the other—with them it is "Coelum, non animum, mutant."

The fourth, Hydropathia, I need not remind you is of ancient date, though recently brought forward as a sovereign balm, or the absurdity of its being the only one thing needful, but the incalculable amount of good it has effected in the prevention of disease cannot be named, and if, as we are told, cleanliness be godliness, its advantages have been moral as well as physical. Celsus describes its use in hydrophobia to allay its spasms. "In this hopeless state," he says, "the only remedy is to throw the patient instantly and without warning, into a fish-pond, plunging him under the water that he may drink, then raising his head and forcing him under it and keeping him below till he is filled with water, so that the thirst and water-dread may be relinquished at once." And Von Helmont, at a later date, kept the patient under water till the choir could sing the psalm *Miserere.*

It is here worthy of remark how singularly void of information on all that pertains to medicine are men of learning, men erudite in every other branch, yet seeming incapable of forming a correct opinion on that subject in which their lives are most interested.

Lord Bacon says it is accounted an error to commit a natural body to empiric physicians, which commonly have a few pleasing receipts, whereupon they are confident and adventurous, but know neither the causes of the disease, nor the complexion of patients, nor the peril of accidents, nor the true method of cure.

Still one chooses for his physician an Allopath, another a Homoeopath, a third an Eclectic, without, for an instant, giving a thought as to whether the individual man thus chosen be competent to manage the intricacies of disease, or blindly ignorant of the first-most rudimentary principles of any skill—a simple retailer of other men's ideas. Not many years since, a man by the name of John Long, a prototype of a Dr. Tumblety, in this country, commenced the sale of a wonderful specific in the City of London, with plenty of effrontery and a pleasing address, he soon found his sales increasing, and, fired with ambition at such success, issued a card with the name of St. John Long, and "in one year's operations his pass-book at his bankers contained credit to the amount of £13,400." Little more than a century back the British House of Commons passed "an act for the providing a reward to Joanna Stephens, upon proper discovery to be made by her, for the use of the public, of the medicines prepared by her," granting her the enormous sum of £5,000 sterling. A committee of twenty was appointed by the Government for the examination, who reported that she had made the discovery to their satisfaction, and that "we have examined the medicines, and her method of preparing the same, and are convinced, by experiment of the utility, efficacy, and dissolving power thereof."

These medicines, in the words of the lady, "are a powder, a decoction and pills; the powder consists of eggshells and snails, both calcined. The decoction is made by boiling some herbs (together with a ball, which consists of soap, swine-cresses, burnt to blackness, and honey) in water. The pills consist of snails calcined, wild carrot seeds, burdock seeds, ashen keys, hips and haws, all burned to blackness, soap and honey. Preposterous as was this recipe, it was purchased in that enlightened age which a distinguished chronicler said, "produced more men of letters as well as more men of science, than any epoch of similar extent in the literary history of England.

I now give one quotation from Dr. Mason, good in confirmation of my position: "Whilst a few species of diseases are now no longer to be found, which are described by earlier writers, a few seem to have supplied their place which are of modern origin; yet, upon the whole, the march of nature is but little interfered with, and hence the prognostics and aphorisms of Hippocrates, the medical histories of Aretæus and Galen, of Rhages and Avicenna, are transcripts of animal life in our own day. The extensive families of fevers and spasmodic affection are, in the main, the same now as they are represented to us by the most ancient writings that have descended to us,—with, however, this improvement, that cases requiring *then* from three to six months for a cure, *now* take only as many weeks, and three to six weeks *now* get their quietus in as many days. The great lesson which experience has taught has been physiological, and consequently the course of treatment has become more positive and definite, hence the more favorable result. From Hippocrates we have the first link supplied by Galen to the end of the Greek Schools—Celsus then furnishes the Italian. The Schools of Bagdad by Serapion, and through the Monks till about the time of Sydenham, all of whose works are handed down to us and translated into our language, and the whole of the schools represented by these writers were united upon what is called the Humoral Pathology of disease—the same as is taught by the schools of medicine at the present day.

Mr. Jeafferson, in his book De Doctoribus, says the lives of three physicians, Sydenham, Sir Hans Sloane, and Heberden, completely bridge over the uncertain period between old empiricism and modern science. Sydenham was born in 1624, and received the most important part of his education in the University of Oxford. Sir Hans Sloane continued till 1753—his museum was purchased by the British Government and became the nucleus of the present British Museum. Heberden extended the time to the beginning of the present century and was the instigator of the transactions of the College of Physicians, to the first volume of which he was the chief contributor.

I will only refer to one or two instances to show the scientific application of medicines for the relief of disease: First,—Affections of the liver or bilious complaints, as they are called, and peculiar to this country.

A secretion of this organ called hepatine is readily changed into sugar by the disturbance of particular nervous functions, or interruptions of the circulation of the blood through the vena-porta. Now this occurs in all cases of biliary calculi or obstructions of the biliary ducts, rendering the most trifling derangement of the liver a cause of this nonazotic, unfibrous and most abnormal secretion. Now, not one of the theories named, could, as such, directly have the slightest effect in removing or changing this sugar from the blood, yet to the scientific man I have only to name casein or rennet of milk as one substance that would convert it into lactic acid, the natural gastric juice of the system.

The other is Scrofula, or generally known as incipient consumption. All organized bodies are composed of carbon, hydrogen, nitrogen, and oxygen. This disease is produced by excess of hydrogen in the proportion to form water with oxygen, and a deficiency of nitrogen to form fibrin or proper muscular contractility. Again, not to enumerate the particular remedies, I may say that all such as contain nitrogen in excess and are deficient in hydrogen, of these oxalic and tartaric acid, the cyanides, and ammoniacal salts, are familiar examples. Thus, Sir, the great point of separation between the profession and empiricism is on the subject of *education*,—the former holding that whatever theory is followed, the practitioner must understand anatomy, physiology, pathology, chemistry, and the nature and effects of medicines, the action of mental influence upon disease, sufficient knowledge of collatteral sciences to judge so far as they bear upon their patients, atmospheric influence, chemical tests, and the use of the microscope; and, in addition, their minds expanded by study, enabling them to comprehend and unravel the intricacies of a complex and difficult complaint, with sufficient moral acquirement to ensure patience, long suffering, forbearance, gentleness, kindness, and unflinching firmness; and a trusting confidence that He who holds the sparrow in its fall, will guide their counsels and direct their skill.

REVIEWS.

A new arrangement of Phanerogamous plants, with especial reference to relative position, including their relations with the Cryptogamous. By Benjamin Clarke, F.L.S., M.R.C.S. London, sold by the author, 2 Mt. Vernon, Hampstead, 1866.

This work, expected for some time, is at length before us; and, though we cannot pretend now to offer such a critical examination as it deserves, we are desirous of introducing it to the notice of those interested in its subject, with such remarks as occur to us on a first perusal. And first, it is quite certain we think that there is room for such a work; and that, if it makes any considerable approach towards accomplishing its object, it will confer a great boon on the lovers of botanical science. Nay, even if its principles should prove unsound or insufficient, and its results should not satisfy the mind, it is still true that the laborious endeavour to promote knowledge deserves grateful acceptance, and that many years cannot have been devoted to such inquiries by an intelligent and patient investigator, so situated as to have access to many rare specimens, without important facts being brought to light, and hints afforded which will assist others in the pursuit of the same object. It must be admitted that the proper limits and true relations of the families of plants are not yet understood; and, if there are real relations at all in nature, which we for our part cannot doubt, their discovery must be an object of the highest interest and importance. We have no sympathy with those who make light of system in Natural Science. It is justly remarked by the present distinguished President of the Linnæan Society, in his annual address, in reference to the sort of contempt with which some seem now to regard system in Zoology and Botany: "This is surely a mistake. Without a good system, clearly identifying the subjects of observation, no biological inquiries can have any practical advantage; and, in all our reviews of the progress of our science, we ought equally to appreciate the labours of the systematist, the physiologist, and the biologist, provided that each in his own department has duly called in aid the results obtained in the others." We should be disposed even to go beyond the learned President, not valuing a good system only or chiefly for its enabling us clearly to identify the subjects of observation, but accounting the relations which it brings to our knowledge as among the most valuable results of our studies; and believing that, as nature can only be usefully examined through the medium of a system, the best system will give us the truest and most practically valuable acquaintance with its wonders and beauties.

Mr. Clarke, in the work before us, deserves the praise of endeavouring to improve system by means of biological knowledge, and that not only what he could collect from others, but what he obtained by patient and varied observation.

The vegetable kingdom is so beautiful, and, for many reasons, so interesting to man, that many persons desire to acquire some knowledge of it. There is no general insensibility to the value of the trees of the forest, the grain, fruits, and vegetables of the field and garden, or to the beauty of the wild flowers of our fields and woods, or those with which culture adorns the parterre or the green-house. Many feel the desire occasionally to make them the subject of scientific study, but they are met by difficulties which discourage and repel all but the most persevering; and which oblige even these to be satisfied with becoming acquainted with a certain number of objects without forming any clear idea of an order of nature among the subjects of their study, or of the well-distinguished groups which make up the whole. Since a professedly natural method has been generally adopted, the genera have undoubtedly been collected into those higher families which among plants are, by an improper application of that term (inconsistent, at least, with its use in other parts of Natural Science), called *Orders;* but, although much is thus gained, these families have not always characters easily recognised by the student; and higher combinations, presenting distinctly to the mind larger associations, are absolutely essential to our enjoying the advantages of good classification. So far as concerns the highest divisions of all, we cannot but think that Jussieu's Acotyledoneæ, Monocotyledoneæ, and Dicotyledoneæ, exhaust the subject, and are so well supported by every part of vegetable structure, that we may rest on them with full satisfaction; but it is, at the same time, clear to us that they are not *classes* in the sense in which it is convenient to use that term in Natural Science, but what in Zoology are called sub-kingdoms or branches, and that the other proposed classes, if good at all, are such sections of these sub-kingdoms as ought to be called classes; but the difficulty is that, between the sub-kingdoms and the great families which it is customary to call *orders*, we need and have not yet obtained such good divisions, conformable to nature and separated by well-marked characters, as might with propriety take this name. The Gymnospermous Exogens may be a good class of Dicotyledoneæ (for the structure is Dicotyledonous, though the cotyledons are more than two); and it is possible, though less clearly made out, that Lindley's Dictyogens may be a good class of Monocotyledoneæ (of its members being within that sub-kingdom there can be no doubt); but there remains in each sub-kingdom a great assemblage of families which must afford means for establishing good divisions of equal importance with these, though such divisions have not yet been detected. In what he calls alliances, Dr. Lindley made an admirable attempt, making the best use of what had been done by others, and exerting to the utmost his own great powers to unite the so-called orders into larger groups, which should be at once natural, because resting on important real characters, and capable of definition. Different opinions will be entertained as to the measure of success attained by him. Of the value of the plan, we think there ought to be but one opinion, and we see with pleasure that, though differently worked, it is adopted by Mr. Clarke. Many of Lindley's alliances—indeed, a very large proportion of them—seem to us good. In a few instances he appears to us to give undue importance to an unsupported technical character; in others we fancy we see artificial separations of what a right estimate of nature would combine; and there are, doubtless, instances of obscure orders placed by a not very happy guess; but, on the whole, the work deserves the highest admiration; and if such alliances, carefully reviewed, were combined into classes, we might, at length, boast of possessing a Natural System.

For assistance, in improving our views, we have to look to such labourers as Mr. Clarke, and we receive his attempt with welcome, and with respectful, and we hope, candid attention. We only wish we had better means in our power, in our remote position, for testing the accuracy and real value of some of the points which he especially relies upon. We will, however, offer a few remarks which occur to us, whilst bearing our humble testimony to the claim of the author, to have his plans examined with care by those whose thoughts are turned to the interesting subject on which he has bestowed so much industry and ingenuity.

We cannot help wishing that Mr. Clarke had not expressed himself in a manner implying the truth of the Darwinian[*] hypothesis respecting the origin of species, and seeming to make relationship always dependent on a common descent. This hypothesis will, no doubt, for some time be very much regarded by scientific inquirers in all their investigations; but, however strongly it may attract some minds, it is not too much to say that it is not yet satisfactorily proved, and that it labours under some great difficulties and serious objections. A really good classification, independently formed, might greatly assist our judgment on the question, but the assumption of the hypothesis, and the attempt to trace the order of descent of the multiplied forms occurring in nature, can only encourage fanciful analogies, and interfere with our application to the great questions, What are the parts? and, What are the circumstances respecting them? which, in themselves, and from their connection with general structure, have most real importance in determining affinities and leading us to a natural grouping of objects. Mr. Clarke's arrangement is certainly not rendered more plausible by the fancy that Endogens (Monocotyledoneæ) are derived through Riccia and Lemna from Marchantiaceæ; Epigynose Dicotyledoneæ through Balanophoraceæ from Bryaceæ; the Chloranthal division through Gnetaceæ and Lycopodiaceæ from the same source, and so in other instances. We cannot but be struck with the insufficiency of the analogies by which, in one or two cases, it is attempted to justify these speculations. Take for example the relation of Endogens to Marchantiaceæ. The author expresses himself thus:—"I am aware that there is no evidence to show that any near affinity exists between *Lemnaceæ* and *Ricciaceæ*, further than that the habit of some species of *Riccia* is so much like that of *Lemna*, that they are stated to have been mistaken for species of that genus by some authors, while species of the latter genus have in fact been described as belonging to the former; and although habit is often of little value as a character among phanerogamous plants, it is acknowledged to be of more importance among the cryptogamous. But as the present arrangement includes the placing of all the cryptogamous families in relation with the phanerogamous, the Endogens should in all probability be compared to one, at least, of their lowest forms; and as the Ricciaceæ have no affinity with the apetalous forms of Exogens, a negative evidence is afforded of their being the cryptogamous form of the *Lemnaceæ*." What this amounts to is, that granting the truth of the system, and that each race of higher plants is derived from, or immediately related to, some form of the lower, there seems some probability that Ricciaceæ afford the form nearest to Lemnaceæ, there being cases in which the foliage, when the flowers or fruit cannot be found, may be mistaken one for the other. The system being by no means proved, we might leave any reader to judge of the importance to be attached to the analogy; but we may ask whether the resemblance between the smaller water lilies and Brasenia to Hydrocharis and Limnobium in one direction, and to Menyanthes and Limnanthemum in another, is not quite as striking, though it suggests no idea of near relationship. Certainly when the flower and fruit are not procurable, we might well be in doubt of which of these genera we had obtained the foliage. We cannot but strongly censure the practice of some botanists, amongst whom is Mr. Clarke, of speaking of cryptogamous and phanerogamous as two great divisions of the vegetable kingdom, thus disguising the fact that the latter includes two divisions, as well separated from each other, and by as important characters, as either is from cryptogamous; just as in zoology, we know of nothing more misleading than the use of the division into vertebrata and invertebrata, when each great branch of the latter is as distinct from the others as any of them is from vertebrata. Curiously enough it is among Cryptogamous—flowerless or spore-bearing plants, whose growth commences from a primordial cell, without an embryo being formed and preserved in a seed—that we have made the farthest advances towards a true and good classification, the full recognition of which would have been no disadvantage to Mr. Clarke in making his comparisons. The sub-kingdom naturally falls asunder into three good classes, each of which has the same number of alliances, under which all the orders or families are readliy arranged. We have first *Thallogens*, or Thallophytes, with no proper distinction of stem and leaves; with no chlorophyll, no stomata, and the lowest reproductive type, though always, we believe, two cells intermingle their contents to form a spore capable of germination. Here are ranged Fungales, Lichenales, and Algales. Secondly, *Anogens*, with stomata and the green colour of vegetation depending on the presence of chlorophyll, but with no vascular system, and reproduction in a prothallus which is temporary, the plant producing successive ones periodically. Here rae found Charales, Hepaticales, and Muscales. Thirdly, *Acrogens*, with an imperfect vascular system, and reproduction from a prothallus in which the fertilized archegonium developes the spore-producing plant, of which the prothallus usually resembles an initial condition. Here are placed Equisetales, Lycopodales and Filicales. We doubt much whether this exposition of the Acotyledonous or Sporigenous sub-kingdom, on the correctness of which we rely with great confidence, and which affords the best indications we have of what we may expect to find in the higher sub-kingdoms, is quite consistent with Mr. Clarke's attempt to connect the muscal alliance with Epigynose Dicotyledoneæ. Granting that he is right, that Epigynose plants are lower in structure than Hypogynose, from which Perigynose cannot be properly separated, we have still to consider the proper position of Gymnospermæ, and many powerful arguments may be adduced in justification of their usual position below other Dicotyledoneæ, but even passing by this point, what is the true value of Mr. Clarke's analogies? Grant that some Bryaceæ are parasitical, though more are only epiphytical, but parasitism is a mode of nutrition found in various parts of the vegetable system far removed from each other. The involucre of Jungermanniaceæ is compared with those occurring in Chamælauciaceæ, Calyceraceæ, and Dipsaceæ. The analogy is surely but a slight one, and other cases may prove it unimportant. In Quercus the female fruit is surrounded by numerous scales, which are leafy organs. The fruit of palms of the section Calameæ is enveloped in such scales, completely combined into one covering, and in both instances the single seed has overpowered the rudiments of other carpels with their germs; yet there is no relation between Quercus and the Calameæ; and though leafy organs may give origin to the teeth on the urn-shaped capsule or spore-case of Bryaceæ, their structure is so far removed from that of Epigynose Dicotyledoneæ, and adherence of parts under pressure, is so widely diffused a phenomenon of vegetable growth that no inference can be drawn from the resemblance, such as it is. Assuming that the diclinous and apetalous characters are but of secondary importance, and that there is no clear or useful line between Hypogynosæ and Perigynosæ, then if this kind of character, founded on the closeness or separation of the circles of the flower, be really available for leading distinctions, we ought in the sub-kingdom Dicotyledoneæ to place Gymnospermæ as the lowest class, Epigynosæ next, and Hypgynosæ as the highest; but ought we not rather to derive our classes from particulars relating to the embryo? and are we yet prepared to say that this is impossible?

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[*] We refer, here, specially to the transmutation and gradual formation of species, by descent from others. Mr. Clarke may not receive Darwin's special views as to the mode in which species arise, but he appears to hold the doctrine of their gradual growth, one out of another; which, indeed, is by no means peculiar to Darwin, and did not originate with him, but is the foundation of his system, and will be resisted by all those who view Nature as a perfect plan, proceeding from Divine intelligence, which it is the object of our efforts to understand and interpret.

We are far from being satisfied with Mr. Clarke's view of the analogies between the vegetable and animal kingdoms. It is no doubt true that the total absence from plants of the sensory and motive organs limits our opportunities for noting differences amongst them: and with respect to nutrition, whilst animals, living on organized substances, have great variety in the means for securing what they need, plants absorbing their inorganic nutriment on a plan which is nearly uniform in them all deprive us of another series of valuable characters upon which in the animal kingdom we rely much. Still the nutritive system of plants displays very important varieties, some of which deserve more minute study than they have yet received, and their reproductive system whilst essentially corresponding with that of the animal kingdom is so wonderfully varied as of itself alone to be almost sufficient for a good system, although we can by no means admit the wisdom of refusing the aid of organs connected with nutrition where we find them affording clear and constant characters. Mr. Clarke finds an analogy between Actiniadæ and phanerogamous plants, which if it is any thing beyond the superficial resemblances so often observable in nature must be very vague and general. He thinks indeed that a leaf is a true branch and analogous to the limb of an animal, but assuredly there is no analogy between the branch or limb of a plant and the limb of an animal, the former is the growth of a bud attached to, but in every respect resembling the parent stem and having, like it, leaves specially organized for their peculiar function. In truth if we would see any relation between an animal's limb and a leaf it must be, though then but slight, by carefully distinguishing the leaf from the branch: the inference from the monstrosity of a cabbage leaf is very far fetched and unsatisfactory. Actiniadæ belong to a great series of animals made up of a definite number of merosomes each supplied with all the vital organs as if so many separate simple animals had been compressed into complete union round a common axis thus becoming a single individual, their flower like aspect results from this arrangement. A flower is the reproductive system of a plant, formed by a modification of its leafy organs, which by the suppression of the axis are in that case brought into successive circles. Is there any more than a superficial resemblance, unconnected with structural analogies, between the two?

But we have not yet touched upon the really important part of Mr. Clarke's work. We cannot but feel that he has himself given very insufficient explanation of his meaning and of the way in which he arrives at his conclusions in respect to the Procarpous and Heterocarpous characters, and we need also to be better informed as to the theoretical grounds on which he rests the importance of these characters. They may be very important and they form a fit subject for investigation. Thus far we chiefly judge of them by their results which by no means always agree with our feeling of what is natural, which however is only the general effect of previous judgments and impressions occurring without reference to this view of the subject, and is only worth anything so far as our own previous judgments rested on clear and solid characters which it would not be easy to overbalance by other views of the matter. It seems reasonable in such a case that we should await further knowledge and study before we presume to pronounce any judgment, but we think it would have been better if the author had explained and defended his ideas more fully. We should like also a fuller explanation on the subject of the position of the raphe, we mean as to the theoretical grounds for the special importance attached to it, and the proof that can be given of its intimate connection with natural grouping. The elaborate tables given by the author form a most interesting study to any one desiring to understand the affinities of plants. Being the chief part of the work they have been allowed to give the book a peculiarly awkward shape making it a real difficulty to read it. It is however worth reading and studying and we hope it will meet with attention from those who are in a position to form the best estimate of it.

In reference to the table of Monocotyledoneæ or Endogens, we may state that the leading division into Exorhizal and Endorhizal appeared to us *a priori* a good one, since it was once supposed that all Monocotyledoneæ were endorhizal, and when it was observed that many of them were exorhizal, it would naturally be concluded that these latter approached the Dicotyledoneæ, and were more highly developed than the others, and this idea would correspond well with the facts, but for the decision at which our author has ultimately arrived respecting Palmaceæ, which he places among the exorhizals, whilst we feel irresistibly compelled to give it a position near the grasses. Can he be wrong on this point, respecting which he seems to have hesitated long? If not, such an anomaly of structure throws doubt on the value of the character. There are few characters more important than *Venation*, when it affords definite results. Now all palms, whether pinnately or palmately veined, have straight veins, simple with the least possible cross connection. Arals, on the contrary, to which Mr. Clark believes the palms allied, have a complex venation, showing an approach towards the boundary of Monocotyledoneæ, only their lowest forms approximating to simplicity and parrallelism of venation. Comparing palms with grasses, the largest grasses approach to their aspect, the bractes among the flowers form a striking point of resemblance corresponding with the glumes of Graminaceæ ; in Cornucopiæ we have even a grass in which the lowest bracte, almost envelopes the spike of flowers as in palms. Palms have only two fertile carpels, the third being aborted and not a few have but one seed as in grasses where the two styles and stigmas are conspicuous. Altogether we know of no suggested relation of palms which can be compared in probability in every possible view with that to grasses, and we feel sure that botanists will not be persuaded to abandon it. Otherwise, we should accept at once as the classes of Monocotyledoneæ, Endorhizeæ, Exorhizeæ and Dictyogenæ, for we still hold to Lindley's class which in Mr. Clarke's arrangement may be considered as occupying the highest place though only as an alliance of the Exorhizeæ.

In his preliminary remarks in the section on the "value of other floral characters," &c., besides the Epigynous, and Procarpous and Heterocarpous, we meet with the following paragraph relating to Irregularity :—" The occurrence of irregular flowers, where they are irregular in the highest degree, especially if the ovary is reduced to one carpel, and that anterior, and the raphe where the ovule is pendulous is next the placenta, is beyond doubt also a character indicating a comparatively higher degree of development, even though it may not extend through the whole of the family, and it may be a question if there is any material exception to this peculiarity of structure as a guide to affinity, as far as regards subdivisions. On these principles the *Proteaceæ* and *Leguminosæ* and their allies, in which the Apocarpous ovary occurs in conjunction with the irregular flower * * * * will decidedly take their places as the highest developed forms of plants."

We confess that we cannot see the force of this reasoning. Irregularity, as is generally agreed, and is certainly proved by examples of return to regularity from increased nutriment, especially in terminal flowers, is due to unequal distribution of nutriment—that is to say, less development of some organs than of others in the same circle—and how it should mark general increased development we cannot conceive.

There are perhaps few alliances without one or more irregular orders, but are these deemed superior in any sense to the regular ones? Lindley assigns to the Daphnal alliance, in which he places Proteaceæ (which, however, is insulated by Mr. Clarke) a solitary carpel, but Thymelaceæ have certainly two or more carpels, though only one seed; Lauraceæ, as Endlicher perceived, have three; Cassythaceæ, two or three; and the fact of their being so pressed together as to form or perfect only one seed, marks a lower type. The solitary carpel of Proteaceæ is due to great irregularity with close pressure; and even if this order is assumed to have no connection with Daphnales, the single envelope, and the close adherence upon it of the stamens, are characters opposed to high development. Granting that the Perigynose character is not separable from the Hypogynose for any useful purpose, it still indicates partial union of some of the floral circles from near position and some amount of pressure. We presume then, that if the Hypogynose structure is higher than the Epigynose, the highest forms are those which are most completely hypogynose, having all the organs and circles distinct, and that all degrees of union place the plants displaying them somewhat lower, a principle which certainly places Leguminosæ below Ranunculaceæ. Besides, must we not always place full development of all parts rudimentally existing above the partial abortion of certain circles, and will not this compel us to set Spiraea above Leguminosæ, and generally the regular above the nearly related irregular?

We should feel detailed criticism of the tables to be for us at least premature at present, but there are some of the combinations which we have much difficulty in conceiving to be true, and the evidence does not yet come before us with any appreciable force. We want, as a preliminary step, an attempt to estimate the real meaning or relation to vegetable structure of every character that has been much used by any eminent systematic botanist since the triumph of the natural method, with an examination of its comparative value, as drawn both from reasoning on the importance of organs and modes of considering them, and from experience of the results of their use. We should thus know whether the value assigned to a character rests on good scientific principles; and though many points might for a time remain unsettled or liable to question, we could not but feel our foundations to be more solid, and our building more symmetrical and more promising of satisfaction.

In the meantime, nothing can contribute more to clearness of ideas than simple, intelligible, and strictly accurate terminology. It is, we think, quite time that the expressions, *Monopetalous* and *polypetalous*, should give place to better terms. We never liked, as a matter of taste, and from a preference for simplicity in conveying an idea, *gamopetalous* and *dialypetalous*, though they are greatly to be preferred to the old terms; but why not use *Synpetalous* and *apopetalous*, with the corresponding terms for the several circles of the flower, observing, however, that *Syncarpous*, which is often employed, is only truly applicable to the case of the union of whole fruits, as in our pretty American twin-berry (Mitchella repens). To express union or separation of the portions of the fruit of one flower, we must employ *Syncarpellous*, *apocarpellous*, and let us be rid, except in Linnæan phraseology, of the term pistil, which is so specially liable to misconception and abuse. Again, the plan strongly insisted upon by Lindley, of naming all Orders from a type genus by an adjective ending in *aceæ*, has such obvious and decided advantages, that we are almost disposed to be angry with those botanists who will still obstinately use the other terminations, given accidentally, or from regard to sound only, before this improvement was thought of, and will cling to *Umbelliferæ*, *Cruciferæ*, &c., when the better method is before them. Mr. Clarke is a sinner in these matters, and should not think them beneath his attention. We have last spoken of an improvement in the expression of Botanical affinities, by Dr. Lindley, but that great botanist was, in other matters, an adherent of the terminology which expressed the mistaken ideas of preceding times to an extent which greatly injures his descriptions of plants, and which is very conspicuous in his otherwise useful work, "Descriptive Botany." We part, for the present, from Mr. Clarke's book, with the observation that we believe there is much good in it, and that it well deserves study; but our own faith is in finding out the leading types of vegetable structure, and subdividing each of these so as to have groups analogous with each of the primary types, and so on in farther subdivision; whilst the attempt to show the derivation of each section, and to trace the various groups to their origin in lower forms, we must declare to be thus far utterly unsatisfactory, and to hold forth no rational promise of better success in future W. H.

Catalogue of Birds known to Inhabit Western Canada, systematically arranged according to the method adopted in the Museum of the University of Toronto. By the Rev. W. Hincks, F.L.S., &c., Professor of Natural History, University College, Toronto.

List of Birds observed near Hamilton, C.W., by Thomas McIlwraith. Extracted from the proceedings of the Essex Institute. Vol. V. 1866.

We have, here, two catalogues of the birds of Western Canada: one as general as it could be made from the information within the author's reach; the other professedly local, and the expression of actual personal knowledge and observation, yet the latter reaches 241 species, including several not found in the more general list, which only numbers 271. It is much to be regretted that Mr. McIlwraith's list was not, like an earlier one, which he communicated to this journal, some years since, among the materials accessible in compiling Professor Hincks' list, which it was hoped might be a useful aid to lovers of ornithology, throughout the country. For their convenience, we will here give the names of the birds added by Mr. McIlwraith, which may be inserted in their places in the more general catalogue. But we must first notice the difficulty of comparing the two lists, from the different order in which the birds are placed, and the great difference in the names employed.

The writer of this article being the compiler of one list, has, of course, no idea of adding to its authority by any expression of approbation here. He performed a very humble labour, at the request of the Board of Arts and Manufactures, to assist in the public object of sending to the Paris Exhibition as good a set as the time would allow of being collected of the feathered inhabitants of Western Canada. He employed the arrangement and nomenclature to which he is accustomed, and which seemed to him most likely to be of general use. In immediate reference to Mr. McIlwraith's list, he adds, now, a few words of explanation. At the head of his own catalogue is a key to its arrangement. To assist comparison, he will here attempt to explain Dr. Baird's plan, which is followed by Mr. McIlwraith. Neither of the two, it will be observed, is that found in ordinary ornithological works. First, Dr. Baird begins with the birds of prey—our 2nd. order—and with the family Vulturidæ—our 3rd. family in this order—which, indeed, does not appear in our catalogue, as we learn, for the first time, from Mr. McIlwraith's present list, that Cathartes aura, the turkey-buzzard (his only Vulture), visits Canada occasionally. We place the Eagles first, as the most powerful and specially Raptorial group; then the Falcons; then the Vultures, and last of all the Owls. There are, also, differences in the order of the sub-families. Dr. Baird, not only like Cuvier, puts Insessores, the perching birds, after the birds of prey; but, also, after the order Scansores, and not receiving Cuvier's Suborders of Insessores; he adopts a new set, which would mislead the student of ordinary ornithological works. We believe it comes very near the system explained by the editor of Orr & Co.'s English edition of Cuvier, in his additions to the text. Thus, we have Humming-birds, Swifts, represented by our chimney-swallow, Night-hawks, King-fishers, and then the general body of perching-birds, amidst which are introduced the swallows. The remaining orders occur in the usual series: Gallinaceous birds, Waders, Swimmers. We cannot now criticise this system, or bring it into comparison with our own. We only wish to give the reader some aid in comparing the different lists. But, the chief difficulty will be found in the names employed. Dr. Baird assumes that species must not be supposed to be common to Europe and America; hence, Aquila chrysætos becomes A. Canadensis; Circus cyaneus, C. Hudsonius; Falco peregrinus, Falco anatum, &c., &c.; besides which, small sections, or subgenera, are all distinguished by generic names, increasing their number in a manner very trying to the memory; and which, in fact, nearly takes away the use of generic groups; besides all which, there are a few instances in which the decisions of Dr. Baird, and Dr. Geo. Gray, respecting the generic names proper to be adopted, differ. It is, then, scarcely to be wondered at that so large a proportion of our birds appear under different names, in lists derived from such different authorities. With great respect for Dr. Baird's scientific character and acquirements, we think a wise discretion is exercised in preferring Dr. Gray's names for our Canadian use. We know that some excellent practical ornithologists amongst us think that even he has carried sub-division too far; but few would be satisfied with the vague generic characters of earlier times; and, it is desirable to follow some widely-recognized authority. Looking around, we can find none better than Dr. Geo. Gray.

We may now give the additions to our general list of the birds of Western Canada, derived from Mr. McIlwraith's latest Hamilton list:

Ord. Insessores. Subord. Dentirostres.
Fam. Laniidæ: 1. Myiobius Traillii. Traill's Fly-catcher.
Subord. Conirostres.
Fam. Sturnidæ: 2. Xanthornis varius. The orchard oriole.

Ord. Raptores. Fam. Aquilidæ.
3. Buteo Bairdii. Baird's buzzard.
4. Buteo elegans.
Fam. Vulturidæ.
5. Cathartes aura. The Turkey-buzzard.
Ord. Grallatores. Fam. Charadridæ.
6. Charadrius hiaticula. The piping plover.
Ord. Natatores. Fam. Laridæ.
7. Stercorarius pomarinus.
8. Hydrochelidon fissipes.
Fam. Anatidæ: 9. Anser frontalis.
Fam. Alcidæ: 10. Uria grylle.
11. Uria Troile.

Of these eleven species, Xanthornis varius was known to us as Canadian, but accidentally omitted. We hesitated about the two species of Uria, but did not consider that we had certain evidence. Both species of Buteo, and the Anser, we still regard as uncertain as to their being good species.

We add, here, that in our list, Ibis falcinellus should have been I. guarauna, which is equivalent with I. Ordii, of Mr. McIlwraith's list. Phaleropidæ should have been made a family, and Alcidæ occurs twice, being, in the first instance, a misprint for Colymbidæ Divers. We shall be glad to record any further additions to the list of our Native birds.

Mr. McIlwraith deserves the gratitude of all Canadian ornithologists. W. H.

A short treatise on the Milk-weed, or Silk-weed, and the Canadian nettle, viewed as industrial resources. By Alexander Kirkwood. Read before the Ottawa Natural History Society, 15th. Feb., 1867.

This little pamphlet deserves the attention of all who are interested in the growth and prosperity of this Province; and, especially, of all who are engaged in agricultural pursuits. It is strictly a practical treatise, giving instructions for the culture of the plants, and preparation of the fibre, as well as showing the reasons for believing in their value as textile materials. The subject well deserves attention, and we hope Mr. Kirkwood's treatise will obtain a large circulation, and exercise a useful influence. W. H.

ON THE SOURCE OF MUSCULAR POWER

BY EDWARD FRANKLAND, PH.D., F.R.S.

The following pages comprise the most important parts of a lecture lately delivered, by Professor Frankland, at the Royal Institution. The subject is one which has, for some time past, attracted the attention of chemists and physiologists, as it had become evident that our old ideas on the matter were incorrect.

Mr. Frankland has, it appears, fully proved this by actual experiment; and the paper is so interesting, both to chemists and physiologists, as well as in an economic point of view, that we present a full extract to the readers of the Canadian Journal. H. C.

What is the source of muscular power? Twenty years ago, if this question had been asked, there were but few philosophers who would have hesitated to reply, "The source of muscular power is that peculiar force which is developed by living animals, and which we term the *vital force!*" but the progress of scientific discovery has rendered the view implied in such an answer so utterly untenable that, at the present moment, no one possessing any knowledge of physical science would venture to return such a reply. We now know that an animal, however high its organization may be, can no more *generate* an amount of force capable of moving a grain of sand, than a stone can fall upwards or a locomotive drive a train without fuel. All that such an animal can do is to liberate that store of force, or *potential energy*, which is locked up in its food. It is the *chemical change* which food suffers in the body of an animal that liberates the previously pent-up forces of that food, which now make their appearance in the form of *actual energy*—as heat and mechanical motion.

From food, and food alone, comes the *matter* of which the animal body is built up; and from food alone come all the different kinds of *physical force* which an animal is capable of manifesting.

The two chief forms of force thus manifested are *Heat* and *Muscular motion* or *mechanical work*, and these have been almost universally traced to two distinct sources—the *heat* to the oxidation of the *food*, and the *mechanical work* to the oxidation of the *muscles*.

This doctrine, first promulgated, the speaker believed, by Liebig, occupies a prominent position in that philosopher's justly celebrated 'Chemico-Physiological Essays.'

In his work entitled 'Die organische Chemie in ihrer Anwendung auf Physiologie und Pathologie, Braunschweig, 1842,' Liebig says, "All experience teaches that there is only one source of mechanical power in the organism, and this source is the transformation of the living parts of the body into lifeless compounds. . . . This transformation occurs in consequence of the combination of oxygen with the substance of the living parts of the body." And again, in his 'Letters on Chemistry, 1851,' p. 366, referring to these living parts of the body, he says, "All these organized tissues, all the parts which in any way manifest force in the body are derived from the albumen of the blood; all the albumen of the blood is derived from the plastic or sanguineous constituents of the food, whether animal or vegetable. It is clear, therefore, that the plastic constituents of food, the ultimate source of which is the vegetable kingdom, are the conditions essential to all production or manifestation of force, to all these effects which the animal organism produces by means of its organs of sense, thought, and motion." And again, at page 374, he says, "The sulphurized and nitrogenous constituents of food determine the continuance of the manifestations of force; the non-nitrogenous serve to produce heat. The former are the builders of organs and organized structures, and the producers of force; the latter support the respiratory process, they are *materials for respiration*."

This doctrine has since been treated as an almost self-evident truth in most physiological text-books; it has been quite recently supported by Ranke;* and, in his lecture 'On the Food of Man in relation to his Useful Work, 1865,' Playfair says, page 37, "From the considerations which have preceded, we consider Liebig amply justified in viewing the non-nitrogenous portions of food as mere heat-givers. . . . While we have been led to the conclusion that the transformation of the tissues is the source of dynamical power in the animal." At page 30 he also says, "I agree with Draper and others in considering the contraction of a muscle due to a disintegration of its particles, and its relaxation to their restoration. . . . All these facts prove that transformation of the muscle through the agency of oxygen is the condition of muscular action." Finally, in a masterly review of the present relations of chemistry to animal life, published in March last,* Odling says, page 98, "Seeing, then, that muscular exertion is really dependent upon muscular oxidation, we have to consider what should be the products, and what the value of this oxidation." . . . And again, page 103, "The slow oxidation of so much carbon and hydrogen in the human body, therefore, will always produce its due amount of heat, or an equivalent in some other form of energy; for while the latent force liberated by the combustion of the carbon and hydrogen of fat is expressed *solely in the form of heat*, the combustion of an equal quantity of the carbon and hydrogen of voluntary muscle is expressed *chiefly in the form of motion*."

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* 'Tetanus eine Physiologische Studie.' Leipzig. 1865.

Nevertheless, this view of the origin of muscular power has not escaped challenge. Immediately after its first promulgation, Dr. J. R. Mayer wrote,† "A muscle is only an apparatus by means of which the transformation of force is effected, *but it is not the material by the chemical change of which* mechanical work is produced." He showed that the 15 lbs. of dry muscles of a man weighing 150 lbs. would, if their mechanical work were due to their chemical change, be completely oxidized in 80 days, the heart itself in 8 days, and the ventricles of the heart in 2½ days. After endeavouring to prove by physiological arguments that not one per cent. of the oxygen absorbed in the lungs could possibly come into contact with the substance of the muscles, Mayer says, "The fire-place in which this combustion goes on is the interior of the blood-vessels, the *blood* however—a slowly-burning liquid—is the oil in the flame of life. . . . Just as a plant-leaf transforms a given mechanical effect, *light*, into another force, *chemical difference*, so does the muscle produce mechanical work at the cost of the chemical difference consumed in its capillaries. Heat can neither replace the sun's rays for the plant, nor the chemical process in the animal: every act of motion in an animal is attended by the consumption of oxygen and the production of carbonic acid and water; every muscle to which atmospheric oxygen does not gain access ceases to perform its functions."

But Mayer was not the first to conceive this view of muscular action. Nearly two hundred years ago, a Bath physician, Dr. John

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* 'Lectures on Animal Chemistry.'

† 'Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel,' 1845.

Mayow,* distinctly stated that for the production of muscular motion two things are necessary—the conveyance of combustible substances to the muscle by the blood, and the access of oxygen by respiration. He concluded that the chief combustible substance so used was fat. A century before Priestley isolated oxygen, Mayow was aware of its existence in the air, in nitre, and in nitric acid; he knew that combustion is supported by the oxygen of the air, and that this gas is absorbed in the lungs by the blood, and is absolutely necessary for muscular activity.

For two decades this doctrine sank into oblivion; and it is only within the last two years that it has been again advanced, chiefly by Haidenhain,† Traube, and, to a limited extent, by Donders.‡

Experimental evidence was, however, still wanting to give permanent vitality to the resuscitated doctrine; for although the laborious and remarkable investigations of Voit‖ and of Edward Smith§ point unmistakably in the direction of Mayow and Mayer's hypothesis, yet the results of these physiologists were not sufficiently conclusive to render the opposite view untenable. This want of data of a sufficiently conclusive character has been supplied by a happily conceived experiment undertaken by Fick and Wislicenus in the autumn of last year, and described in the 'Philosophical Magazine,' vol. xxxi. p. 485. In the application of these data, however, to the problem now under consideration, one important link was found to be wanting, *viz.* the amount of actual energy generated by the oxidation of a given weight of muscle in the human body. Fick and Wislicenus refer to this missing link in the following words:—"The question now arises what quantity of heat is generated when muscle is burnt to the products in which its constituent elements leave the human body through the lungs and kidneys? At present, unfortunately, there are not the experimental data required to give an accurate answer to this important question, for neither the heat of combustion of muscle nor of the nitrogenous *residue* (urea) of muscle is known." Owing to the want of these data, the numerical results of the experiment of Fick and Wislicenus are rendered less conclusive against the hypothesis of muscle combustion than they otherwise would have been, whilst similar determinations, which have been made by Edward Smith, Haughton, Playfair, and others, are even liable to a total misinterpretation from the same cause.

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* 'De Motu musculari,' 1681. Mayow was born in 1645, and died 1679.

† 'Mechanische Leistung Wärmeentwickelung und Stoffumsatz bei der Muskelthätigkeit,' 1864.

‡ As this is passing through the press, the speaker has become aware that Messrs. Lawes and Gilbert advocated this doctrine in 1852, and repeatedly since; their opinions being founded upon experiments on the feeding of cattle.

‖ 'Untersuchungen uber den Einfluss des Kochsalzes, des Kaffeés und der Muskel-bewegungen auf den Stoffwechsel,' p. 150. Munich, 1860.

§ 'Phil Trans.,' 1861, p. 747.

The speaker stated that he had supplied this want by the calorimetrical determination of the actual energy evolved by the combustion of muscle and of urea in oxygen. Availing himself of these data he then proceeded to the consideration of the problem to be solved, the present condition of which might be thus summed up:—It is agreed on all hands that muscular power is derived exclusively from the mutual chemical action of the food and atmospheric oxygen; but opinions differ as to whether that food must first be converted into the actual organized substance of the muscle, before its oxidation can give rise to mechanical force, or whether it is not also possible that muscular work may be derived from the oxidation of the food, which has only arrived at the condition of blood and not of organized muscular tissue.

The importance of this problem can scarcely be overrated; it is a corner-stone of the physiological edifice, and the key to the phenomena of the nutrition of animals. For its satisfactory solution the following data require to be determined:—

1st. The amount of force or actual energy generated by the oxidation of a given amount of muscle in the body.

2nd. The amount of mechanical force exerted by the muscles of the body during a given time.

3rd. The quantity of muscle oxidized in the body during the same time.

If the total amount of force involved in muscular action, as measured by the mechanical work performed, be greater than that which could possibly be generated by the quantity of muscle oxidized during the same time, it necessarily follows that the power of the muscles is not derived *exclusively* from the oxidation of their own substance.

As regards the first datum to be determined, it is necesssary to agree upon some unit for the measurement of mechanical force. The unit most commonly adopted is that represented by the lifting of a kilogram weight to the height of one metre. The researches of Joule and Mayer have connected this standard unit with heat;—they prove that the force required to elevate this weight 425 times will, when converted into heat, raise the temperature of an equal weight of water 1° C. If this weight were let fall from a height of 425 metres, its collision with the earth would produce an amount of heat sufficient to raise the temperature of 1 kilogram of water 1° C. The same heating effect would also of course be produced by the fall of 425 kilograms through 1 metre. This standard of force is termed a *metrekilogram;*[*] and 425 metrekilograms are equal to that amount of heat which is necessary to raise the temperature of 1 kilogram of water through 1° C. If then it be found that the heat evolved by the combustion of a certain weight of charcoal or muscle, for instance, raises the temperature of 1 kilogram of water through 1° C., this means, when translated into mechanical power, 425 metrekilograms. Again, if a man weighing 64 kilograms climbs to a height of 1,000 metres, the ascent of his body to this height represents 64,000 metrekilograms of work; that is, the labour necessary to raise a kilogram weight to the height of 1 metre 64,000 times.

The author then proceeds to describe the manner in which he determined the actual energy developed by one gram of each the substance in the following list, when burnt in oxygen:—

Beef Muscle	2,161	Metrekilograms of Force.
Albumin	2,117	
Beef Fat	3,841	
Hippuric Acid	2,280	
Uric Acid	1,108	
Uria	934	

The heat evolved was determined by means of a calorimeter of peculiar construction; the substance being burnt by means of chlorate of potassa, and various corrections introduced.

It is evident that the above determination of the actual energy developed by the combustion of muscle in oxygen represents more than the amount of actual energy produced by the oxidation of muscle within the body, because, when muscle burns in oxygen its carbon is converted into carbonic acid, and its hydrogen into water; the nitrogen being, to a great extent, evolved in the elementary state;

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[*] I follow the example of the Registrar-General in abbreviating the French word *gramme* to gram.

whereas, when muscle is most completely consumed in the body, the products are carbonic acid water and urea ; the whole of the nitrogen passes out of the body as urea—a substance which still retains a considerable amount of potential energy. Dry muscle and pure energy yield, under these circumstances, almost exactly one-third of their weight of urea, and this fact, together with the above determination of the actual energy developed on the combustion of urea, enables us to deduce with certainty the amount of actual energy developed by muscle and albumen respectively when consumed in the human body. It is as follows :—

Actual energy developed by one gram of each substance when consumed in the body.

Name of substance dried at 100° C.	Heat units. (Mean.)	Metrekilograms of force. (Mean.)
Beef Muscle purified by ether . . .	4368	1848
Purified Albumen	4263	1803

The second point, viz., the amount of mechanical force exerted by the muscles of the body during a given time, was ascertained from the experiments of Fick and Wislicenus, during their ascent of the Faulhorn, from the Lake of Brienz. The third point, viz., the amount of muscle oxidized in the body, as ascertained from the experiments of the above-named observers, on the quantity of nitrogen secreted in the urine, both before, during, and after the ascent.

From the above data the following table was constructed :—

	Fick.	Wislicenus.
	Grams.	Grams.
Weight of dry Muscle consumed	37·17	37·00
	Metrekilograms	Metrekilograms
Actual energy capable of being produced by the consumption of 37·17 and 37·00 grams of dry Muscle in the body	68,690	68,376
Measured work performed in the ascent (external work)	129,096	148,656
Calculated circulatory and respiratory work performed during the ascent (internal work) . .	30,541	35,631
Total ascertainable work performed . .	159,637	184,287

It is thus evident that the muscular power expended by these gentlemen in the ascent of the Faulhorn could not be exclusively derived from the oxidation, either of their muscles, or of other nitrogenous constituents of their bodies, since the maximum of power capable of being derived from this source even under very favourable assumptions is, in both cases, less than one-half of the work actually performed. But the deficiency becomes much greater if we take into consideration the fact, that the actual energy developed by the oxidation or combustion cannot be wholly transformed into mechanical work. In the best constructed steam-engine for instance, only $\frac{1}{10}$ of the actual energy developed by the burning fuel can be obtained in the form of mechanical power; and in the case of man, Helmholtz estimates that not more than $\frac{1}{5}$ of the actual energy developed in the body can be made to appear as external work. The experiments of Haidenhain, however, show that, under favourable circumstances, a muscle may be made to yield in the shape of mechanical work as much as one-half of the actual energy developed within it, the remainder taking the form of heat. Taking then this highest estimate of the proportion of mechanical work capable of being got out of actual energy, it becomes necessary to multiply by 2 the above numbers representing the ascertainable work performed, in order to express the actual energy involved in the production of that work. We then get the following comparison of the actual energy capable of being developed by the amount of muscle consumed, with the actual energy necesssary for the performance of the work executed in the ascent of the Faulhorn.

	Fick.	Wislicenus.
	Metrekilograms.	Metrekilograms.
Actual energy capable of being produced by Muscle metamorphosis	68,690	68,376
Actual energy expended in work performed .	319,274	368,574

Thus, taking the average of the two experiments, it is evident that *scarcely* $\frac{1}{5}$*th of the actual energy required for the work performed could be obtained from the amount of muscle consumed.*

Similar though not quite so conclusive results were obtained from experiments made on prisoners engaged in treadmill labour, on military prisoners engaged in shot drill, and on various kinds of labourers.

We have seen, therefore, in the above four sets of experiments, interpreted by the data afforded by the combustion of muscle and urea in oxygen, that the transformation of tissue alone cannot account for more than a small fraction of the muscular power developed by animals; in fact, this transformation goes on at a rate almost entirely independent of the amount of muscular power developed. If the mechanical work of an animal be doubled or trebled there is no corresponding increase of nitrogen in the secretions; whilst it was proved on the other hand by Lawes and Gilbert, as early as the year 1854, that animals, under the same conditions as regarded exercise, had the amount of nitrogen in their secretions increased twofold by merely doubling the amount of nitrogen in their food. Whence then comes the muscular power of animals? What are the substances which, by their oxidation in the body, furnish the actual energy, whereof a part is converted into muscular work? In the light of the experimental results detailed above, can it be doubted that a large proportion of the muscular power developed in the bodies of animals has its origin in the oxidation of non-nitrogenous substances? For whilst the secretion of nitrogen remains nearly stationary under widely different degrees of muscular exertion, the production of carbonic acid increases most markedly with every augmentation of muscular work, as is shown by the following tabulated results of E. Smith's highly important experiments regarding the amount of carbonic acid evolved from his own lungs under different circumstances.*

Excretion of carbonic acid during rest and muscular exertion:—

	Carbonic acid per hour.	
During sleep	19 0	grams.
Lying down and sleep approaching	23·0	"
In a sitting posture	29·0	"
Walking at rate of 2 miles per hour	70·5	"
" " 3 " "	100·6	"
On the treadwheel, ascending at the rate of 28·65 feet per minute	189·6	"

It has been already stated as a proposition upon which all are agreed, that food, and food alone, is the ultimate source from which muscular power is derived; but the above determinations and considerations, the speaker believed, prove conclusively, firstly, that the non-nitrogenous constituents of the food, such as starch, fat, &c., are the chief sources of the actual energy, which becomes partially transformed into muscular work; and secondly, that the food does not require to become organized tissue before its metamorphosis can be rendered available for muscular power; its digestion and assimulation into the circulating fluid—the blood—being all that is necessary for this purpose. It is, however, by no means the non-nitrogenous portions of food alone that are capable of being so employed, the nitrogenous also, inasmuch as they are combustible, and consequently capable of furnishing actual energy, might be expected to be available for the same purpose, and such an expectation is confirmed by the experiments of Savoy upon rats,* in which it is proved that these animals can live for weeks in good health upon food consisting almost exclusively of muscular fibre. Even supposing these rats to have performed no external work, nearly the whole of their internal muscular work must have had its source in the actual energy developed by the oxidation of their strictly nitrogenous food.

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* Phil. Trans. for 1859, p. 709.

It can scarcely be doubted, however, that the chief use of the nitrogenous constituents of food is for the renewal of muscular tissue; the latter, like every other part of the body, requiring a continuous change of substance, whilst the chief function of the non-nitrogenous is to furnish by their oxidation the actual energy which is in part transmuted into muscular force.

The combustible food and oxygen coexist in the blood which courses through the muscle, but when the muscle is at rest there is no chemical action between them. A command is sent from the brain to the muscle, the nervous agent determines oxidation. The potential energy becomes active energy, one portion assuming the form of motion, another appearing as heat. *Here is the source of animal heat, here the origin of muscular power!* Like the piston and cylinder of a steam-engine, the muscle itself is only a machine for the transformation of heat into motion; both are subject to wear and tear and require renewal, but neither contributes in any important degree by its own oxidation to the actual production of the mechanical power which it exerts.

From this point of view it is interesting to examine the various articles of food in common use, as to their capabilities for the production of muscular power. The writer therefore made careful estimations of the calorific value of different materials used as food, by the same apparatus and in the same manner as described above for the determination of the actual energy in muscle, urea, uric acid, and hippuric acid.

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* 'The Lancet,' 1863, pages 381 and 412.

The author then appends a series of tables, showing the actual energy developed by one gram of various articles of food, when burnt in oxygen, or when oxidized in the body, together with other tables, showing the weight and cost of various articles of food required to be oxidized in the body in order to raise 140 lbs. to the height of 10,000 feet. From the first table we make the following short extract, to elucidate the concluding remarks :—

	Metrekilograms of force.
Cheese	1,969
Potatoes	429
Oatmeal	1,696
Bread Crumb	945
Beef (lean)	664
White of Eggs	284
Milk	280
Beef Fat	3,841
Butter	3,077
Cabbage	184
Pea Meal	1,667

These results are in many instances fully borne out by experience. The food of the agricultural labourers in Lancashire contains a large proportion of fat. Besides the very fat bacon which constitutes their animal food proper, they consume large quantities of so-called apple dumplings, the chief portion of which consists of paste in which dripping and suet are large ingredients, in fact these dumplings frequently contain no fruit at all. Egg and bacon pies and potato pies are also very common *pièces de résistance* during harvest-time, and whenever very hard work is required from the men. The speaker well remembers being profoundly impressed with the dinners of the navigators employed in the construction of the Lancaster and Preston Railway: they consisted of thick slices of bread surmounted with massive blocks of bacon, in which mere streaks of lean were visible. Dr. Piccard states that the Chamois hunters of Western Switzerland are accustomed, when starting on long and fatiguing expeditions, to take with them, as provisions, nothing but bacon-fat and sugar, because, as they say, these substances are more nourishing than meat. They doubtless find that in fat and sugar they can most conveniently carry with them a store of force-producing matter. The above tables affirm the same thing. They show that ·55 lb. of fat will perform the work of 1·15 lb. cheese, 5 lbs. potatoes, 1·3 lb. of flour or pea-meal or of $3\frac{1}{2}$ lbs. of lean beef. Donders, in his admirable pamphlet 'On the Constituents of Food and their Relation to Muscular Work and Animal Heat,' mentions the observations of Dr. M. C. Verloren on the food of insects. The latter remarks, "Many insects use during a period in which very little muscular work is performed food containing chiefly albuminous matter; on the contrary, at a time when the muscular work is very considerable, they live exclusively, or almost exclusively, on food free from nitrogen." He also mentions bees and butterflies as instances of insects performing enormous muscular work, and subsisting upon a diet containing but the merest traces of nitrogen.

We thus arrive at the following conclusions :—

1. The muscle is a machine for the conversion of potential energy into mechanical force.

2. The mechanical force of the muscles is derived chiefly, if not entirely, from the oxidation of matters contained in the blood, and not from the oxidation of the muscles themselves.

3. In man the chief materials used for the production of muscular power are non-nitrogenous; but nitrogenous matters can also be employed for the same purpose, and hence the greatly increased evolution of nitrogen under the influence of a flesh diet, even with no greater muscular exertion.

4. Like every other part of the body, the muscles are constantly being renewed; but this renewal is not perceptibly more rapid during great muscular activity than during comparative quiescence.

5. After the supply of sufficient albuminized matters in the food of man to provide for the necessary renewal of the tissues, the best materials for the production, both of internal and external work, are non-nitrogenous matters, such as oil, fat, sugar, starch, gum, &c.

6. The non-nitrogenous matters of food, which find their way into the blood, yield up all their potential energy as actual energy; the nitrogenous matters, on the other hand, leave the body with a portion (one-seventh) of their potential energy unexpended.

7. The tranformation of potential energy into muscular power is neccesarily accompanied by the production of heat within the body, even when the muscular power is exerted externally. This is, doubtless, the chief and, probably, the only source of animal heat.

[E. F.]

A STUDY OF THE CEPHALIC DISK OF THE REMORA. [ECHENEIS.]

From the " Comptes Rendues."

Abstract by the author of a memoir by M. E. Bandelot, presented to the Academy by M. E. Blanchard.

The disk on the head of the Remora has been, from the most remote times, an object of interest to observers. Among modern Naturalists, some, as Voigt, and Stannius, have advanced the opinion that the disk may be regarded as the equivalent of a dorsal fin ; but this mode of viewing the subject has not been supported by a rigorous demonstration, since there are certain interior portions of the disk whose relations have not been determined ; moreover the mechanism by means of which the attachment of the disk is accomplished, has not yet been analyzed and explained in a satisfactory manner. The researches which I have the honor to submit to the Academy, have for their object the solution of these still obscure problems. The disk of the Remoras occupies, as is well known, the upper surface of the head. Its figure is that of a much elongated oval, of which the border, a little elevated, consists of a fold of the skin so disposed as to form around the organ a sort of flexible case. The upper surface of the disk is level, it presents on each side of the median line, a series of little transverse laminæ, nearly parallel, and slightly inclined backward, so as partly to cover each other like the laths of a Venetian blind. Between these folds are as many corresponding empty spaces.

Excepting the border, the disk is supported by an internal frame-work formed by a considerable number of small bones, disposed in a series of similar segments regularly succeeding one another from behind forward. Each segment consists of the following pieces, four in number : one interspinal bone, two radial bones, and an articular bong element.

The interspinal bone is a small unpaired piece, occupying the median line on the lower face of the disk, of the form of a sharp spine with its point downwards, its aspect in every respect bringing to our minds the interspinal bones which support the rays of the fins ; it is of the same nature with them.

The rays are represented by two little bony stems set across in a horizontal plane and articulated at their base on the level of the median line, with the corresponding interspinal bone. Each of these stems, taken alone, corresponds with a half-ray of a fin, this half, instead of remaining closely attached to its fellow in a vertical plane, being withdrawn from it so as to lie down sideways.

The articular bone element is an unpaired, symmetrical bone, extended across the disk, of which it occupies the whole width. It consists of a very narrow middle portion, and of two lateral portions, enlarged into laminæ, or quadrilateral plates. From the upper surface of these latter, protrudes a little lamellose apophysis directed backwards (the articular apophysis) under which is fixed the extremity of the ray belonging to the same segment.

This bony element, the nature of which has been hitherto misunderstood, must be regarded, according to my view, as the homologue of the little bony nodule found in the fin at the separation of the bases of the two parts of each ray.

As to the mechanism by means of which the attachment of the disk is accomplished, it is easily apprehended when one has considered the arrangement of the parts of this little apparatus. Each ray (of the transformed fin) in fact serves as a support for one lamina of the disk. It is capable of moving upon its anterior extremity as if upon a hinge, and consequently of inclining forward or backward, the lamina to which it belongs. This double movement is secured by means of little muscles which are inserted, at one extremity, on an apophysis at the base of the rays projecting at the lower face of the disk, at the other on the interspinous bones of the neighbouring segments. These muscular bundles correspond with the elevators and depressors of the rays of the fins.

It is easy to demonstrate by a very simple geometrical construction, that when the lamellæ of the disk are erected, the space which they enclose is increased; the air included is consequently rarified within this space, and as all communication with the exterior is stopped by the cutaneous fold which borders the disk an effect of suction is produced which may be, in every respect, compared with that of the cupping glass.

ENTOMOLOGICAL SOCIETY OF CANADA.

An ordinary meeting of this society was held at the residence of the President, J. H. Sangster, Esq., M.D., Yorkville, on Friday, March 1st, at 7 o'clock, p.m. Frequent showers of rain, accompanied by lightning—an unusual circumstance so early in the year—rendered the attendance very limited indeed. The President took the chair, and the minutes of the Annual General Meeting of 1866, and a Field Meeting held on the 1st of June, were read and adopted; the Fenian raid, which called away many of the members to their duty as volunteers, and the threatened attack of cholera, which engrossed the attention of others, prevented any subsequent meetings being held.

A communication was read from the Hon. James Cockburn, Solicitor General West, in reply to an application for a grant from Government in aid of the funds of the Society, stating that the Finance Minister could not recommend any fresh grants for scientific objects, as the country was on the eve of Confederation. It was resolved that further application should be made as soon as the Confederation of the Provinces has taken place.

Mr. W. H. Ellis, of University College, Toronto, was proposed and unanimously elected an ordinary member of the Society.

To the Library,

From the Author,—"Synopsis of the Diptera of the Eastern Archipelago," and "Characters of undescribed species of Smiera (*Chalcidites*)," by F. Walker, Esq., F.L.S.

From the QUEBEC BRANCH:—The Annual Report, President's Address, Bylaws, etc., of the Branch.

To the Cabinet,

From F. Walker, Esq., British Museum, London, Eng. :—A box of British and Exotic Lepidoptera, Coleoptera, and a few other insects, received through the Smithsonian Institution, Washington, D.C.

The Secretary stated that he had procured, by purchase, for the Library of the Society, the first five volumes of the Proceedings of the Entomological Society of Philadelphia, and that as soon as they came from the binder's hands, they would be placed in the rooms of the Society; he also stated that Mr. Saunders, Curator of the London Branch, has preparing, and expected shortly to have published for the Society, a list of Canadian Coleoptera, containing about 800 species.

The announcement of the death, by typhoid fever, of Dr. Brackenridge Clemens, of Eastern Penn., on the 11th of January last, was received with much regret. Dr. Clemens was one of the best American Entomologists of the day, and had attained a wide reputation beyond the limits of his own country; he was the author of a most beautiful Monograph of North American Sphingidæ, many "contributions of American Lepidopterology," &c., and was the only authority on the Micro-Lepidoptera on this continent.

Mr. Bethune mentioned a few rare Lepidoptera, new to Canada, that had been captured by members during the past year; among others *Thecla strigosa*, Harris, and *Lycæna pembina*, Edw. by Mr. Saunders; *Erebus odora*, lines, by Dr. Sangster; and *Philampelus sattelitia*, lines, by the Rev. Clements. The meeting then proceeded to the examination and discussion of Sphingidæ, the appointed subject for the evening. The Rev. Prof. Hincks made some interesting remarks upon their classification and that of insects in general, based upon a "quinary system;" Dr. Sangster exhibited a large number of rare and beautiful specimens and Mr. Bethune, a specimen of an undetermined Sphinx, captured by Mr. Pettit, at Grimsby, C. W. Twenty-eight species of this family are now known to inhabit this country.

Before the close of the meeting, it was resolved that for the future ordinary meetings of the Society be held on the *First Friday* in each month, from September to May inclusive, at 7 p.m.; and that from May to August inclusive, Field meetings be held at 9, a.m., on each *second* and *last Saturday* of the month; notice of the place of meeting to be duly announced beforehand. The next meeting will be held at Professor Croft's, Yorkville, on Friday, April 5th, at 7, p.m.

After partaking of Dr. Sangster's kind hospitality, the meeting adjourned.

C. J. S. B.

OBITUARY.

THE REV. EDWARD HINCKS, D.D.

The influential positions occupied in Canada by more than one member of the family of the late Rev. Thomas Dix Hincks, LL.D. Professor of Hebrew and Oriental languages in the Belfast Academical Institution, confers an additional interest here on the death of the most distinguished among his sons. Dr. Edward Hincks obtained a fellowship at Trinity College, Dublin, with distinction rarely, if ever equalled, before he was twenty one. In the first honors thus obtained, he chiefly displayed his mastery of mathematical science. His later triumphs turned mainly on his no less thorough command both of the classical and oriental languages. His early training amid all the special advantages of the paternal roof, no doubt tended to give this peculiar bias to his tastes, and to direct him to the field of his later successful labours.

Dr. Edward Hincks was born at Cork, in Aug. 1791. Soon after obtaining his fellowship he took orders in the Church of England, and was presented by his College to the Rectory of Ardtrea, which he subsequently exchanged for that of Killyleagh in the Diocese of Down. There the last forty one years of his life were spent; and those labours carried out which have won for him a European reputation as one of the most profound and original philologists of the 19th century. The period in which he lived was one presenting peculiar facilities and inducements to his favourite investigations. The discovery of the famous Rosetta Stone took place in his early youth; but he had already obtained distinction as a philologist before the labours of Young and Champollion furnished the long sought key to the mystery of Egyptian hieroglyphics. To this interesting department of philological research he now applied his extensive knowledge: and frequently gave evidence of a rare talent for deciphering its novel characters and unknown language.

But the labours of Professor Grotefend of Gottingen had, so early as 1802, accomplished for the cuneiform alphabet of the Persepolitan inscriptions, what Dr. Thomas Young subsequently did for the ancient characters of Egypt; and the alphabet thus partially deciphered, was augmented by the ingenious researches of Rask of Denmark. To those discoveries, the later explorations of Botta and Layard gave a new interest; and the name of Dr. Edward Hincks will ever be associated with those of Rawlinson, Oppert, and others of the most profound European philologists who have devoted themselves to the deciphering of the cuneiform inscriptions of Persepolis, Nineveh, and other ancient seats of Asiatic civilisation. He laboured with unwearied perseverance in this novel field of research; and won a reputation, especially among German scholars for great acuteness and sagacity, combined with caution and patient conscientiousness. A writer in the *Athenæum* speaks from personal knowledge, of the high terms in which he was referred to by such continental scholars as Roediger and Ewald; and adds: "His talent for deciphering texts in unknown characters and languages was wonderful. It was applied to the study of Egyptian hieroglyphics, and to the inscriptions in the cuneiform character. In this field especially he laboured for years with great perseverance and success, having been the first to ascertain the numeral system, and the power and form of its signs, by means of the inscriptions at Van. He was one of the chief restorers of Assyrian learning, throwing great light on the linguistic character and grammatical structure of the languages represented on the Assyrian monuments." His interpretations of these inscriptions were disputed for a time by men of the first class, such as Rawlinson and Grotefend, who had already committed themselves to other views; but we believe the principles of interpretation which he was the first to discover and explain, are now generally accepted as true and indisputable.

It is not to be overlooked, when estimating the value of Dr. Hincks' labours, that they had to be carried on, for the most part in a remote Irish village, hampered with inadequate means, and dependent wholly on indirect resources for the study of the ancient inscriptions of Egypt and Assyria.

An Irish writer in the *Northern Whig*. complains that men have been advanced to the highest offices and honours of the Church; to bishoprics and archbishoprics, some of whom could not translate a verse of the Hebrew bible *ad aperturam libri*: while incomparably the most learned man in the Church, and inferior to none in personal and moral qualifications was left to die in the possession of the moderate living he had received from his College nearly half a century before. We cannot think that it would have been a wise use of the patronage of the Crown to have hampered a scholar devoted to such engrossing researches, with the onerous duties of a bishopric But so long as Deaneries and prebendal stalls are reserved for men like Buckland or Stanley; no fitter occupant of such could have been found than the deceased Irish Scholar. In London within reach of the British Museum, or placed in charge of its Egyptian and Assyrian treasures, the nation would have been amply repaid by the results to which such facilities would have given birth. As it is his literary remains are by no means slight. Many valuable papers are printed in the *Transactions of the Royal Irish Academy*, the *Royal Society of Literature*, and the *Asiatic Society*: others were communicated to the British Association; in the sections of which the present writer has repeatedly met him. His profound learning seemed almost to disqualify him from dealing with a popular audience; and it was sometimes amusing to observe the simplicity and *naivete* with which he would solve the difficulty suggested by some tyro, in reference to the interpretation of a Nimroud cylinder or a cuneiform inscription, by a Hebrew or Arabic quotation, or an appeal to Zend or Sanskrit roots. Nevertheless when occasion required, Dr. Hincks could forsake his study for the arena of public life; and was known as a moderate, but consistent liberal in the political questions which have of late years assumed such grave significance in Ireland, in reference to education, the franchise, and the Church itself. The courage and independence he manifested in dealing with some of those vexed questions, is believed to have been a hindrance to his promotion in the Church. He was, however, in receipt of a small literary pension bestowed on him in acknowledgement of his labours as a scholar. The King of Prussia manifested the estimation in which he was held by the philologists of Germany by conferring on him an order of Knighthood; and the foremost literary societies of Europe had bestowed their chief distinctions on him.

Dr. Hincks was in his seventy-sixth year at the time of his death. Throughout his long life he had laboriously devoted his rare learning to cope with the most obstruse problems in epigraphy and philology. But with all his great attainments he was modest, simple-hearted, and kind; and has left behind many who affectionately mourn his loss on private, as well as on public grounds.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JULY, 1866.

Latitude—43 *deg.* 39.4 *min. North.* *Longitude*—5 *h.* 17 *min.* 33 *sec. West.* *Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Resul't.	ME'N		
					°	°	°	°	°												°							
1	29.847	29 845	—	—	58.0	73.5	—	—	—	.382	.453	—	—	79	55	—	—	S b E	S	Calm.	S 14 W	0.5	9.0	0.0	3.28	3 36	0.005	...
2	.833	.751	29.705	29.7565	61.6	71.7	63.7	65.73	+ 0.73	.456	.504	.479	.487	84	64	81	77	S b E	S S W	Calm.	S 22 W	2.0	10.0	0.0	3.44	3.63	Inp	...
3	.636	.532	.478	.5352	62.7	78.5	67.7	69.57	+ 4.42	.504	.441	.503	.497	88	45	75	71	Calm.	S b W	SW b W	S 24 W	0.0	14.0	8.8	6.20	6.40	.135	...
4	.343	.305	.403	.3503	61.2	72.4	64.5	66.22	+ 0.92	.499	.495	.507	.498	92	62	83	79	S S W	W	S W b S	S 68 W	3.8	18.0	2.2	3.21	4.03	.660	...
5	.510	.507	.524	.5305	63.7	76.7	63.4	67.83	+ 2.45	.504	.640	533	.576	85	69	91	85	Calm.	S S E	S W	S 28 W	0.0	8.5	2.0	3.17	3.42	.110	...
6	.567	.554	.532	.5502	68.8	81.4	69.9	73.60	+ 8.00	.640	.773	.584	.659	79	75	91	81	Calm.	S S W	Calm.	S 32 W	0.0	10.0	0.0	4.15	4.17	...	...
7	.533	.514	.502	.5093	69.9	77 8	69.2	73.23	+ 7.53	.584	.723	.650	.664	79	75	91	81	S W b S	S S W	SW b W	S 39 W	4.0	3.0	3.0	2.19	2.24	.410	...
8	.464	.514	—	—	67.4	78.5	...	—	—	.645	.571	—	—	96	59	—	—	Calm.	N W b N	Calm.	N 45 W	0.0	8.0	0.0	5.07	6.09	.480	...
9	.761	.838	.850	.8237	61.6	69.5	60.1	64.33	— 1.65	.393	.420	.366	.390	71	59	70	65	N	S	N N W	N 25 E	5.0	3.0	0.5	0.96	2.79	...	...
10	.888	.829	.799	.8438	63.4	72.0	58.7	65.78	— 0.30	.369	.354	.396	.376	63	45	80	61	Calm.	E S E	Calm.	S 72 E	0.0	5.0	0.0	1.49	1.83	...	...
11	.822	.781	.708	.7660	65.5	79 3	66.6	70.83	+ 4.65	.429	.515	.504	.498	68	52	77	67	N N W	S S W	S W	S 34 W	2.0	6.0	1.5	3.46	3.94	...	...
12	.719	.646	.618	.6587	63.0	83.9	70.6	74.18	+ 7.88	.475	.689	.561	.595	82	59	75	70	W b S	S W b S	SW b W	S 43 W	1.5	7.0	2.2	5 11	5.39	...	...
13	.606	.498	.499	.5362	73.1	91.5	76.4	81.10	+14.72	.643	.687	.742	.686	79	47	81	67	Calm.	W b S	W N W	S 79 W	0.0	15.8	4.5	4.60	6.26	.525	...
14	.613	.626	.613	.6172	67.0	74.6	66.6	69.88	+ 3.47	.594	.450	.479	.493	90	52	73	68	NE b E	E	Calm,	N 85 E	3.2	10.0	0.0	3.85	3.88	.010	...
15	.626	.588	—	—	68.1	88.3	—	—	—	.511	.698	—	—	75	52	—	—	Calm.	S W b S	SW b W	S 48 W	0.0	5.0	1.3	3.96	4.67	...	...
16	.657	.628	.635	.6372	77.1	89.7	75.3	80 52	+13.93	.749	.747	.741	.740	80	53	84	72	W S W	W b S	Calm.	S 36 W	1.5	9.8	0.0	3.21	3.45	Inp.	...
17	.651	.567	.586	.6022	74.6	87.9	67.4	75.18	+ 8.50	.702	.785	.617	.689	82	60	91	79	Calm.	S W b S	W b N	S 53 W	0.0	9.0	2.8	3.09	5.62	2.345	...
18	.530	.478	.601	.5365	67.0	65.9	61.2	65.00	— 1.68	.608	.527	.512	.518	92	83	95	89	W b N	N E	NE b N	N 20 E	1.0	11.0	1.5	2.85	3.76	.165	...
19	.679	.722	.742	.7152	59.8	69.9	60.5	64.37	— 2.42	455	.408	.419	.425	89	55	80	71	NE b N	S S E	Calm.	S 83 E	1.5	4.2	0 0	1.80	3.18	...	...
20	.744	.696	.635	.6877	60.5	69.1	61.9	64.82	— 1.95	.360	.381	451	.409	69	54	82	68	NE b N	E	N E	N 61 E	2.8	8.0	3.0	4.76	5.05	...	...
21	.603	.540	.503	.5417	65 2	66.3	65.5	66 38	— 0.38	.523	.562	546	.546	85	87	87	85	NE b N	E N E	N E	N 64 E	1.0	7.8	4.0	3.98	4.37	.145	...
22	.457	.417	—	—	66.3	73.1	—	—	—	.562	.628	—	—	87	78	—	—	Calm.	S b W	Calm.	N 69 W	0.0	3.0	0.0	1.63	4.35	.365	...
23	.438	.503	.559	.5058	61.6	75.3	65.6	68.08	+ 1.20	.481	.513	.518	.516	87	58	82	75	N W	N W	N N W	N 32 W	5.0	6.0	3.5	4.87	5.50	...	...
24	.616	.604	.588	.6022	62.7	77.8	69.5	71.73	+ 4.87	.466	.550	.532	.536	82	57	74	69	Calm.	S S W	Calm.	S 35 W	0.0	4.5	0.0	1.55	2.15	...	...
25	.586	.606	.659	.6178	68.8	78 5	68.8	72.77	+ 5.80	.528	.571	.515	.521	75	59	74	65	N W	S S W	N b W	N 23 W	1.5	1.0	9.2	4.30	5.89	...	...
26	.677	.688	.638	.6688	66.6	77.4	69.9	72.33	+ 5.37	.531	.614	.670	.619	81	65	92	79	N	S E b S	Calm.	S 49 E	6.0	2.5	0.0	0.11	1.77	...	...
27	.651	.620	.564	.6063	66.3	80.3	71.7	74.03	+ 7.05	.535	.656	.691	.631	83	63	89	76	Calm.	S b W	Calm.	N 84 W	0.0	3.4	0.0	0.57	2.11	...	...
28	.524	.448	.466	.4762	69.9	84.3	71.0	75.05	+ 8.08	.541	.493	.536	.538	74	41	73	63	N b W	N W b N	Calm.	N 18 W	1.0	10.0	0.0	2.75	4.13	...	...
29	.470	.436	—	—	68.4	77.5	—	—	—	.467	.483	—	—	67	50	—	—	N b W	S b W	N b W	N 27 W	4.5	5.8	0.8	2.48	3.93	Inp.	...
30	.473	.503	.563	.5187	65.9	77.5	63.0	69.35	+ 2.40	.489	.296	.424	.385	76	31	74	56	N	N	N N W	N 15 W	2.5	8.2	11.0	9.12	9.37	...	...
31	.609	.596	.502	.5600	62.3	74.9	68.1	69.40	+ 2.45	.303	.342	.472	.386	53	39	68	54	N b W	S b W	S	S 5 W	3.0	3.5	3.5	1.42	2.48	.035	...
M	29.6257	29.5992	29.5951	29.6059	65.76	77.08	66.80	70.43	+ 4.18	.514	.544	.530	.535	80	58	81	72	....	....	....	....	1.72	7.42	2.11	... ...	4.17	5.390	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JULY, 1866.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer ....29.915 at 8 a.m. on 10th
Lowest Barometer ... . 29.305 at 2 p.m. on 4th
} Monthly range = 0.610 inches.

Self-registing Thermom.
Maximum Temperature ....94°0 on 13th
Minimum Temperature ....47°8 on 1st
} Monthly range = 46°2
Mean maximum Temperature ....79°60
Mean minimum Temperature ....60°64
} Mean daily range = 18°96
Greatest daily range......35°0 from a.m. to p.m. of 13th.
Least daily range .... 7°9 from a.m. to p.m. of 18th.

Warmest day.........13th ..Mean temperature...............81°10
Coldest day........... 9th ...Mean temperature...............64°33
} Difference = 16°77
Maximum Radiation. Solar...136°2 on 13th
Terrestrial .... 40°0 on 1st
} Monthly range = 96°2

Aurora observed on 3 nights, viz:—12th, 14, and 25th
Possible to see Aurora on 25 nights; Impossible on 6 nights.
Snowing on 0 days; depth ....; duration of fall 0.0 hours.
Raining on 16 days; depth 5.390 inches; duration of fall 33.5 hours.
Mean of cloudiness = 0.50.
Most cloudy hour observed, 2 p.m.; mean = 0.64; least cloudy hour observed, 10 p.m.; mean = 0.38.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1062.79	1191.14	506.20	1190.80

Resultant direction S. 79° W.; Resultant velocity 0.94 miles per hour.
Mean velocity...............................4.17 miles per hour.
Maximum velocity.......................18.0 miles, from 1.30 to 2.30 p.m. of 4th.
Most windy day.........30th............Mean velocity, 9.37 miles per hour.
Least windy day.........26th...........Mean velocity, 1.77 ditto
} Difference = 7.60 miles.
Most windy hour ...... 1 p.m.........Mean velocity, 7.84 ditto
Least windy hour...... 6 a.m ....Mean velocity, 2.02 ditto
} Difference = 5.82 miles.

July 8th. Dense fog a.m. 13th. Very hot day. 14th. Heavy rain, 5.30 a.m., over half an inch in 30 minutes. 15th. Very warm day. 17th. Heavy thunder with very heavy rain 4 to 8 p.m., 1·4 fell during the hour 4 to 5 p.m. 19th. Perfect Solar halo. 20th. Solar halo. 23d. Perfect Rainbow. 31st. Solar halo at noon.

July, 1866, was very warm, the mean temperature shewing an excess above the average never before reached except in July, 1854.

This month, with one exception, was the most rainy July on record.

COMPARATIVE TABLE FOR JULY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	65.8	— 1.2	79.4	48.2	31.2	6	5.270	...	...	...	...	....
1841	65.0	— 2.0	86.3	43.2	43.1	10	8.150	...	...	...	...	0.27 lbs.
1842	64.7	— 2.5	90.5	42.0	48.5	4	3.050	...	...	...	...	0.33
1843	64.5	— 2.5	86.1	40.2	45.9	8	4.605	...	...	...	...	0.44
1844	66.0	— 1.0	86.1	40.5	45.6	12	2.815	...	...	...	...	0.19
1845	66.2	— 0.8	94.6	45.6	49.0	7	2.195	...	...	...	...	0.30
1846	68.0	+ 1.0	94.0	44.9	49.1	9	2.895	...	...	...	...	0.29
1847	68.0	+ 1.0	87.5	43.8	43.7	8	3.355	...	...	...	...	0.19
1848	65.5	— 1.5	82.7	46.7	36.0	10	1.890	...	...	N 14° W	0.18	4.94mls.
1849	68.4	+ 1.4	89.1	51.0	38.1	4	3.415	...	...	S 5° W	0.75	3.52
1850	68.9	+ 1.9	84.9	52.8	32.1	12	5.270	...	...	N 81° E	0.59	4.56
1851	65.0	— 2.0	82.7	52.1	30.6	12	3.625	...	...	N 60° W	0.88	4.13
1852	66.8	— 0.2	90.1	49.5	40.6	8	4.025	...	...	N 43° W	0.93	3.33
1853	65.6	— 1.4	85.4	49.4	36.0	10	0.915	...	...	S 58° E	0.24	3.69
1854	72.5	+ 5.5	93.6	53.0	40.6	9	4.805	...	...	S 49° W	0.37	4.03
1855	77.9	+ 0.9	88.4	53.1	35.3	13	3.245	...	...	S 19° W	0.73	6.47
1856	69.9	+ 2.9	92.0	51.4	40.6	8	1.120	...	...	N 79° W	1.57	5.84
1857	67.8	+ 0.8	85.4	52.4	33.0	15	3.475	...	...	S 68° E	0.81	4.74
1858	67.9	+ 0.9	83.4	55.9	27.5	13	3.072	...	...	N 15° E	1.13	5.76
1859	66.9	— 0.1	87.7	50.5	37.2	12	2.611	...	...	N 56° W	1.48	5.81
1860	63.9	— 3.1	85.8	47.5	38.3	13	4 336	...	...	N 60° W	2.15	7.29
1861	65.4	— 1.6	82.9	49.4	33.5	16	2.635	...	...	N 74° W	1 43	4.66
1862	66.7	— 0.3	88.6	52 6	36.0	15	5.344	...	...	S 89° W	1.42	5.80
1863	67.6	+ 0.6	82.3	49.3	33.0	15	3.408	...	...	N 18° W	0.40	3.89
1864	69.7	+ 2.7	87.9	52.9	35.0	8	1.332	...	...	N 61° W	2.23	6.00
1865	65.0	— 2.0	83.0	45.8	37.2	11	2.470	...	...	N 86° W	2.28	5.34
1866	70.4	+ 3.4	92.2	57.2	35.0	16	5.390	...	...	S 79° W	0.94	4.17
Results to 1864.	66.98	...	87.10	48.72	38.38	10.3	3.474	...	...	N 66° W	0.63	4.97
Excess for 1866.	+ 3.45	...	+ 5.10	+ 8.48	— 3.38	+ 5.7	+ 1.916	...	...	....	..	— 0.80

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—AUGUST, 1866.

Latitude—43 *deg.* 39.4 *min. North.* *Longitude*—5 *h.* 17.33 *min. West.* *Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M		6 A.M.	2 P.M.	10 P.M.	Result'.	ME'N		
1	29.365	29.258	29.300	29.3018	67.7	76.7	65.2	69.27	+ 2.30	.599	.738	.523	.610	88	80	85	85	S b W	S S W	Calm.	S 25 W	5.5	7.0	0.0	5.16	5.18	0.165	...
2	.300	.412	.530	.4278	63.7	71.7	60.2	64.17	— 2.68	.428	.398	.364	.384	72	52	70	64	SW b W	W	W	N 89 W	2.5	17.8	8.2	10.44	10.55	...	...
3	.615	.577	.531	.5657	55.5	68.8	58.0	61.30	— 5.53	.337	.411	452	.414	76	58	94	77	W N W	S W b W	SW b W	S 68 W	6.0	3.4	3.0	2.14	3.23	1.100	...
4	.446	.504	.591	.5238	59.0	71.0	58.7	61.52	— 5.28	.476	.355	.339	.398	95	47	69	74	Calm.	NW b N	NW b W	N 35 W	0.0	14.2	12.0	10.18	10.81	.295	...
5	.629	.591	—	—	58.0	68.8	—	—	—	.359	.309	—	—	74	44	—	—	NW b W	NW b N	W b N	N 59 W	2.0	18.0	1.8	10.09	10.47	...	...
6	.631	.624	.655	.6363	56.5	74.6	56.2	63.45	— 3.32	.356	.233	.328	.294	78	27	72	55	W b N	NW b W	W N W	N 66 W	5.6	14.2	2.0	10.48	10.59	...	...
7	.681	.623	.649	.6492	57.3	74.6	63.0	66.10	— 0.58	.302	.347	.293	.347	64	39	50	55	W N W	NW b W	N N W	N 44 W	11.8	9.4	6.0	4.95	5.35	...	...
8	.646	.547	.400	5143	52.9	67.4	60.1	62.55	— 4.12	349	.392	.489	.426	87	58	94	76	Calm.	E	N E b E	N 48 E	0.0	2.8	3.6	3.52	3.91	.085	...
9	.390	.466	.538	.4753	57.3	71.7	59.8	62.32	— 4.23	.390	.295	.359	.343	83	37	69	63	N	N W	N W	N 45 W	8.8	15.0	4.8	9.07	9.39	...	...
10	.606	.657	.698	.6617	56.9	68.4	61.2	62.90	— 3.62	.374	.416	.317	.373	80	60	58	65	N W	S S W	NW b W	N 54 W	5.0	9.6	1.5	2.90	4.53	...	...
11	.772	.770	.755	.7627	55.1	69.5	59.0	62.48	— 3.97	331	.388	.380	.362	76	54	76	66	N b W	S b E	Calm.	S 27 E	0.5	2.4	0.0	1.17	1.43	...	...
12	.742	.661	—	—	59.0	62.7	—	—	—	.403	.492	—	—	81	86	—	—	N E b E	N E b E	E	N 79 E	2.6	3.2	7.8	5.47	5.74	2.145	...
13	.459	.442	.426	.4393	62.3	64.5	64.8	63.45	— 2.78	.549	.560	.555	.550	98	92	90	91	E N E	N E b E	N b E	N 47 E	6.0	8.8	2.8	4.84	4.93	inap.	...
14	.458	.483	.533	.4995	64.5	72.4	65.5	67.30	+ 1.07	.573	.651	.586	.592	94	83	93	89	Calm.	S W b S	N W	N 35 W	0.0	1.8	1.2	1.06	1.90	.010	...
15	.640	.776	.872	.7798	63.4	63.7	54.0	59.85	— 6.30	.469	.284	.260	.320	80	47	62	61	N	N b W	N b W	N 13 W	11.0	13.6	8.8	9.62	9.97	...	...
16	.949	.909	.869	.9048	49.0	61.6	51.5	54.87	—11.17	.225	.311	.243	.268	65	56	64	61	N b E	S S W	S W b S	S 79 W	5.5	5.2	1.2	0.74	2.43	...	...
17	.856	.742	.712	.7610	47.1	69.5	57.6	59.93	— 6.03	.250	.401	.387	.355	77	55	81	68	Calm.	S b W	Calm	S 31 W	0.0	8.2	0.0	2.05	2.60	..	...
18	.679	.570	.516	.5757	58.0	71.3	63.0	64.95	— 0.88	.416	496	.513	.482	86	64	89	78	Calm.	Calm.	N N E	N 1 W	0.0	0.0	0.8	1.00	1.70	.180	...
19	.457	.402	—	—	58.3	66.6	—	—	—	448	490	—	—	92	75	—	—	Calm.	E b S	N N E	N	0.0	3.0	4.1	2.53	3.40	.355	...
20	.541	.534	.506	.5257	50.4	63.4	58.3	59.10	— 6.45	.340	370	.367	.373	93	63	75	74	S W b N	S S W	S S W	S 66 W	2.8	8.8	1.0	1.23	3.01	.035	...
21	.455	.426	.406	.4222	52.9	68.1	54.7	60.07	— 5.37	.381	.334	.358	.358	95	48	84	72	Calm.	S b W	Calm.	S 60 W	0.0	10.0	0.0	3.14	4.03	.065	...
22	.350	.450	.490	.4383	53.6	61.2	51.1	55.73	— 9.63	.362	.230	.299	.294	87	42	80	67	N W	W	W N W	N 73 W	10.6	14.0	0.6	8.82	8.88	...	...
23	.483	.416	.468	.4528	46.4	60.1	47.9	52.50	—12.65	.212	.319	.230	.258	67	62	69	65	W N W	S b W	Calm.	N 72 W	1.4	1.0	0.0	3.02	3.74	...	...
24	.500	.500	.577	.5290	46.4	56.7	47.2	51.13	—13.83	.278	.290	.268	.270	88	62	82	73	W N W	NW b W	W N W	N 76 W	3.0	12.2	1.5	5.77	5.90	inap.	...
25	.601	.593	.594	.5985	46.4	61.9	49.7	53.65	—11.07	.269	.389	.287	.306	85	69	81	74	W N W	W b S	Calm.	N 89 W	3.2	9.5	0.0	4.16	4.20	...	...
26	.541	.440	—	—	48.6	66.3	—	—	—	.302	.355	—	—	88	54	—	—	Calm	S W b S	Calm.	S 40 W	0.0	11.5	0.0	5.52	5.72	.007	...
27	.482	.489	.546	.5052	57.6	63.0	59.0	61.27	— 3.05	.434	526	.439	.466	92	91	88	86	S W b S	S S W	Calm.	S 31 W	0.8	9.0	0.0	3.62	3.64	...	...
28	.529	.510	.504	.5160	53.6	72.0	62.3	62.88	— 1.25	.384	.528	.471	.456	93	67	84	80	Calm.	S	N b W	N 39 E	0.0	2.5	1.0	0.12	2.33	...	...
29	.559	.554	.568	.5582	59.0	69.2	56.5	60.18	— 3.63	462	.328	.368	.375	93	45	80	73	N N W	N	Calm.	N 44 W	7.8	5.8	0.0	2.25	2.70	...	...
30	.571	.517	.524	.5367	53.3	61.6	57.6	57.92	— 5.72	.366	.381	.410	.393	90	69	86	82	Calm.	E b S	Calm.	S 50 E	0.0	4.0	0.0	1.04	1.67	.015	...
31	.602	.592	.560	.5798	52.9	63.7	63.0	60.90	— 2.42	.372	.452	.487	.450	92	76	85	81	Calm.	E b N	E N E	N 69 E	0.0	6.0	6.8	5.90	5.99	...	...
M	29.5617	29.5534	29.5673	29.5608	55.51	67.34	57.97	60.80	— 4.90	.381	.401	.384	.390	84	59	78	73	....	......	......	......	3.63	8.13	2.60	......	5.16	4.457	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR AUGUST, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 29.977 at 8 a.m. on 16th. } Monthly range=
Lowest Barometer . . . . 29.258 at 2 p.m. on 1st. } 0.719 inches.

Self-registering Ther.
Maximum Temperature . . . . . 77°.0 on 1st and 7th. } Monthly range=
Minimum Temperature . . . . . 42°.4 on 24th. } 34°.6
Mean Maximum Temperature . . 69°64 } Mean daily range=16°92
Mean Minimum Temperature . . 52°72 }
Greatest daily range . . . . 27°1 from a.m. to p.m. of 17th.
Least daily range . . . . 4°3 from a.m. to p.m. of 13th.

Warmest day . . . . 1st...Mean Temperature . . . 69°27 } Difference=18°.14
Coldest day . . . . . 24th...Mean Temperature . . . 51°13 }

Maximum } Solar . . . . 127° 0 on 7th } Monthly range=
Radiation. } Terrestrial . . . . 32°.0 on 25th } 95°.0

Aurora observed on 4 nights, viz.—9th, 11th, 23rd and 30th.
Possible to see Aurora on 17 nights; impossible on 14 nights.
Snowing on days; depth inches; duration of fall hours.
Raining on 14 days; depth 4.457 inches; duration of fall 60.7 hours.
Mean of cloudiness=0 56; most cloudy hour observed, 4 p.m.; mean=0.65; least cloudy hour observed, 12 p.m.; mean=0.49.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1615.77	636.06	503.17	2151.25

Resultant Direction, N. 59° W.; Resultant Velocity, 2 58 miles per hour.
Mean Velocity, 5.16 miles per hour.
Maximum Velocity, 24.1 miles, from noon to 1 p.m. of 5th.
Most windy day, 4th—Mean velocity 10.81 miles per hour. } Difference,
Least windy day, 11th—Mean velocity 1.43 miles per hour. } 9.38 miles
Most windy hour, 1 p.m.—Mean velocity 8.64 miles per hour. } Difference,
Least windy hour, 10 p.m.—Mean velocity 2.47 miles per hour. } 6.17 miles

14th. Dense fog during morning. 19th. Rainbow at 7 p.m.

August, 1866, was both cold and wet. The mean temperature was upwards of 5° below the average—a depression more than twice as great as any that had before occurred.

COMPARATIVE TABLE FOR AUGUST.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum observed.	Minimum observed	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant.		Mean Force or Velocity
										Direction.	Velocity.	
1840	64.7	— 1.5	80.1	47.4	32.7	12	2.905	...	...	...	...	...
1841	64.4	— 1.8	83.5	46 7	36.8	9	6.170	...	...	...	...	0.19 lbs
1842	65.7	— 0 5	80.7	45.3	35.4	6	2.500	...	...	...	...	0.30 "
1843	66.4	+ 0.2	85.5	44.4	41.1	4	4.850	...	...	...	...	0.12 "
1844	64.3	— 1.9	82.5	44.3	38 2	17	Imp	...	...	...	...	0.16 "
1845	67.9	+ 1.7	82.5	44.4	38.1	9	1.725	...	...	...	...	0.19 "
1846	68.4	+ 2.2	86 3	50.4	35.9	9	1.770	...	...	...	...	0.17 "
1847	65.1	— 1.1	83.1	44.9	38.2	10	2.140	...	...	...	...	0.19 "
1848	69.2	+ 3.0	87.5	49.3	38.2	8	0.855	...	...	S 21 E	0.98	4.55 ms
1849	66.3	+ 0.1	79.5	51.4	28.1	10	4.970	...	...	N 71 W	0.60	3.76 "
1850	66.8	+ 0.6	84.2	43.0	41.2	13	4.355	...	...	N 15 E	0.35	4.46 "
1851	63.6	— 2.6	79.8	43.6	36.2	10	1.360	...	...	N 63 W	0.40	4.63 "
1852	65.9	— 0.3	81.2	46.7	34.5	9	2.695	...	...	N 70 W	0.56	3.30 "
1853	68.6	+ 2.4	91.6	47.6	44.0	11	2.575	...	...	S 36 E	0.30	4.26 "
1854	68.0	+ 1.8	98.1	47.0	51.1	5	0.455	...	...	N 64 W	1.76	4.60 "
1855	64.1	— 2.1	82.1	44.9	37.2	7	1.455	...	...	N 63 W	1.04	6.97 "
1856	63.6	— 2.6	81.3	44.0	37.3	12	1.680	...	...	N 50 W	2.88	7.03 "
1857	65.3	— 0.9	85.3	50.1	35.2	13	5.265	...	...	N 77 W	1.51	6.36 "
1858	67.6	+ 1.4	83.4	45.4	38.0	11	3.890	...	...	N 69 W	1.57	6.50 "
1859	66.6	+ 0.4	81.4	46.2	35.2	11	3.900	...	...	N 36 W	1.62	5.96 "
1860	64.5	— 1 7	81.8	47.1	34 7	14	3.405	...	...	N 70 W	1.85	5.80 "
1861	65.5	— 0.7	82.5	48.2	34.3	15	2.955	...	...	N 8 E	0.46	4.21 "
1862	67.6	+ 1.4	87.6	47.7	39.9	15	3.485	...	...	N 78 W	1.67	5.96 "
1863	66.6	+ 0.4	87.2	45.9	43.3	12	2.205	...	...	S 61 W	1.80	4.89 "
1864	68.6	+ 2.4	92.6	48.6	44.0	16	5.060	...	...	N 70 W	1.38	4.75 "
1865	65.2	— 1.0	86.1	46.8	39.3	8	1.990	...	...	N 60 W	1.55	5.07 "
1866	60.8	— 5.4	76.7	45.7	31.0	14	4.457	...	...	N 59 W	2.58	5.16 "
Results to 1864.	66.21	...	84.45	46.50	37.95	10.7	3.020	...	...	N 67 W	0.93	5.18
Exc. for 1866.	—5.41	...	—7.75	—0.80	—6.95	+ 3.3	+ 1.431	...	...	...	...	— 0.02

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO CANADA WEST,—SEPTEMBER, 1866.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *m.* 33 *s. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M	10 P.M.	2 P. M.		6 A.M.	2 P.M.	10 P.M.	Resul't.	ME'N		
1	29.498	29.421	29.342	29.4032	° 60.9	° 67.0	° 63.7	° 64.40	° + 1.37	.478	.594	.570	.550	89	89	96	91	N E b E	E b S	Calm.	° S 89 E	6.5	2.2	0.0	2.10	2.57	0.080	...
2	.358	.347	—	—	65.5	78.2	—	—	—	.586	.670	—	—	93	69	—	—	SW b W	S S W	Calm.	N 79 W	0.5	0.2	0.0	3.18	4.39	...	...
3	.687	.656	662	.6610	59.4	71.0	58.3	62.73	+ 0.30	.422	.512	.367	.436	83	67	75	76	Calm.	Calm.	E	N 28 E	0.0	0.0	2.0	1.84	2.36	...	...
4	.652	.563	.452	.5123	56.9	68.8	65.6	64.00	+ 1.87	.384	.411	.391	.403	83	58	62	69	N	E b N	E N E	N 78 E	2.6	8.0	7.5	3.52	3.78	0.470	...
5	.416	.512	.622	.5250	60.9	70.2	54.4	62.07	+ 0.23	.503	.355	.330	.401	94	48	78	74	Calm.	NW b W	W N W	N 69 W	0.0	16.4	0.6	5.32	5.48	0.055	...
6	.619	.656	.697	.6657	51.5	71.0	61.2	61.70	+ 0.27	.336	.420	.385	.391	88	55	71	71	W N W	S S W	N b E	S 63 W	4.5	7.6	6.2	0.74	3.78	...	...
7	.661	.462	.352	.4688	57.6	59.0	58.3	58.57	— 2.58	.364	.451	.425	.422	76	90	87	86	N E b N	N E b E	NW b N	N 32 E	2.2	10.6	6.2	5.06	6.17	0.860	...
8	.389	.570	.695	.5680	56.2	62.7	53.6	58.15	— 2.58	.417	.343	.329	.362	93	60	80	76	NW b W	N W	NW b N	N 45 W	8.2	14.0	1.6	7.15	7.19	inap.	...
9	.775	.809	—	—	48.6	67.0	—	—	—	.302	.434	—	—	88	66	—	—	Calm.	N N W	N b W	N 33 W	0.0	8.7	6.4	5.12	5.42	...	...
10	.841	.740	.650	.7285	49.3	63.4	56.5	57.43	— 2.62	.313	.369	.413	.377	89	63	91	80	N b W	S b W	Calm.	S 4 E	1.0	2.0	0.0	0 58	1.81	inap.	...
11	.499	.266	.148	.2910	59.8	60.9	61.6	61.05	+ 1.40	.452	.516	.532	.509	88	96	97	94	N E b E	E N E	S	S 72 E	5.8	8.6	2.2	2.68	6.40	0.675	...
12	.169	.176	.319	.2232	60.9	68.1	59.0	62.55	+ 3.32	.479	.525	.336	.437	89	77	67	76	S W b S	SW b W	W N W	S 53 W	7.4	12.8	9.5	9.92	10.27	0.077	...
13	.436	.537	.591	.5332	52.6	64.5	51.1	56.60	— 2.25	.310	.230	.299	.275	78	37	80	63	W S W	W S W	Calm.	S 77 W	5.5	14.0	0.0	6.50	6.53	...	...
14	.537	.395	.613	.5352	45.7	64.8	46.8	51.60	— 6.73	.278	.339	.206	.280	90	55	64	72	Calm.	S W	W b N	S 88 W	0.0	8.4	19.0	9.30	9 90	0.170	...
15	.837	.911	.936	.9018	35.3	52.6	43.5	45.90	—12.02	.181	.169	.205	.208	88	41	72	67	W b S	N W	Calm.	N 85 W	4.0	8.5	0.0	2.09	3.45	...	...
16	.851	.702	—	—	49.3	54.0	—	—	—	.262	.324	—	—	74	78	—	—	S E b E	E b N	N N E	S 78 E	5.2	2.0	0.9	1.15	3.56	0.780	...
17	.524	.601	.632	.5957	59.4	60.9	50.0	56.05	— 0.95	.446	.321	.304	.349	88	59	84	77	N W	NW b N	N N W	N 32 W	9.4	8.6	1.5	5.26	5.35	0.020	...
18	.607	.573	.593	.5873	49.0	53.3	50.8	51.08	— 5.53	.326	.291	.293	.294	94	71	78	78	N N W	N E b E	N E	N 28 E	0.8	1.0	1.0	1.76	1.86	...	...
19	.554	.594	.702	.6220	49.7	55.1	50.4	51.25	— 4.87	.217	.247	.308	.267	69	57	84	71	N	E b S	Calm.	N 40 E	4.6	7 2	0.0	2.58	3.16	inap.	...
20	.685	.517	.361	.4982	48.2	47.5	49.0	48.47	— 7.13	.255	.306	.326	.296	75	93	94	87	N E	N E b N	N E	N 25 E	5.5	9.0	9.7	7.49	9.44	0.560	...
21	.403	.587	.691	.5728	46.4	52.2	41.4	46.20	— 8.92	.290	.234	.171	.232	92	60	64	73	NW b W	N W	NW b W	N 56 W	5.0	10.8	3.0	6.83	7.05	...	...
22	.765	.850	.892	.8392	36.3	52 2	42.5	44.63	—10.00	.193	.254	.236	.226	90	65	86	77	N W	S b W	S	S 5 W	2.2	8.2	2.0	1.12	3.02	...	...
23	.928	.890	—	—	40.3	52.6	—	—	—	.219	.239	—	—	87	60	—	—	N E b N	E b N	E N E	N 82 E	4.2	14 0	5.2	7.28	7.57	...	...
24	.808	.721	.682	.7322	44.3	56.2	58.0	53.90	+ 0.15	.239	.339	.416	.335	82	75	86	79	N E b E	E	Calm.	S 87 E	0.8	8.4	0.0	3.31	3.35	inap.	...
25	.704	.605	.682	.6628	56.2	53.6	48.6	52.57	— 0.67	.383	.384	.282	.351	85	93	82	88	N	N b W	N	N 3 W	7.8	7.0	20.0	9.09	9.20	1.910	...
26	.798	.779	.777	.7858	46.4	56.9	46.1	49.68	— 3.05	.298	.222	.254	.278	94	48	81	79	N	N E b N	Calm.	N 27 W	0.5	3.0	0.0	0.39	1.05	...	...
27	.786	.831	.860	.8257	42.8	61.9	48.2	51.95	— 0.27	.249	.376	.287	.308	87	68	85	79	Calm.	S S W	Calm.	S 31 W	0.0	6.2	0.0	1.59	1.64	...	...
28	.899	.895	.883	.8902	41.4	63.7	52.9	53.75	+ 1.92	.241	.465	.380	.367	92	78	95	87	Calm.	Calm.	Calm.	S 45 W	0 0	0.0	0.0	0.51	0.70	...	...
29	.900	.868	.832	.8595	47.5	62.3	50.4	54.12	+ 2.80	.316	.419	.340	.359	96	74	93	86	Calm.	Calm.	Calm.	S 29 W	0.0	0.0	0.0	0.08	0.20	...	...
30	.800	.775	—	—	47.9	66.3	—	—	—	.321	.444	—	—	96	68	—	—	Calm.	Calm.	NW b N	N 8 E	0.0	0.0	3.5	1.66	2.38	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.6270	29.6114	29.6278	29.6207	50.98	60.79	52.83	55.22	— 2.27	.336	.361	.335	.349	87	67	81	78	....	......	....	....	3.14	6.91	3.60	......	4.63	5.657	......

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR SEPTEMBER, 1866.

Note.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 29 936 at 10 p.m. on 15th. } Monthly range=
Lowest Barometer . . . . 29.112 at midnight on 11th. } 0.794 inches.

Self-registering Ther.
Maximum temperature . . . 80°0 on 2nd. } Monthly range=
Minimum temperature . . . 34°.4 on 22nd. } 45°6
Mean maximum temperature . . 64°00 } Mean daily range=15°27
Mean minimum temperature . . 48°73 }
Greatest daily range . . . . . . 24°5 from a.m. to p.m. of 28th.
Least daily range . . . . 5°0 from a.m. to p.m. of 25th.

Warmest day . . . . 1st...Mean Temperature . . . 64°40 } Difference=19°.77
Coldest day . . . . . 22nd...Mean Temperature . . . 44°63 }

Maximum Radiation { Solar . . . . 130°5 on 27th } Monthly range=
Maximum Radiation { Terrestrial . . . . 26°0 on 22nd } 104°.5

Aurora observed on 3 nights, viz.:—on 3rd, 12th, and 13th.
Possible to see Aurora on 19 nights; impossible on 11 nights.
Snowing on 00 days; depth 0.0 inches; duration of fall 0.0 hours.
Raining on 15 days; depth 5 657 inches; duration of fall, 89.4 hours.
Mean of cloudiness=0.57; Most cloudy hour observed, 2 p.m; mean=0.73; least cloudy hour observed, 10 p.m; mean=0.44.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1404.42	528.93	869.18	1433.20

Resultant direction, N. 33° W.; Resultant Velocity, 1.45 miles per hour.
Mean velocity 4.63 miles per hour.
Maximum velocity 25.4 miles, from 8 to 9 p.m. of 14th.
Most windy day 12th—Mean velocity 10 27 miles per hour. } Difference 10.07
Least windy day 29th—Mean velocity 0.20 miles per hour. }
Most windy hour, 11 a.m.—Mean velocity, 7.83 miles per hour. } Difference
Least windy hour, 2 a.m.—Mean velocity, 2.18 miles per hour. } 5.65 miles.

1st. Thunderstorm.—3rd. Solar halo.—11th. Foggy during day; lightning at night.—12th. Rainbow at 6 p.m.—14th. Thunderstorm during day, with violent gusts of wind.—15th. Thin ice, a m. (first of season)—16th. Thunderstorm at night.—20th. Fog during day.—22nd. Hoar frost, a.m.—23rd. Hoar frost, a.m.—25th. Very heavy rain storm.—27th. Hoar frost, a.m.—28th. Hoar frost; fog at night. 29th. Foggy at night. 30th. Solar halo.

September, 1866, was cold and calm. The amount of rain is the greatest since 1847.

COMPARATIVE TABLE FOR SEPTEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity.
	°		°	°	°							
1840	54.0	— 3.8	70.2	29.4	40.8	4	1.380	...	...	...	...	...
1841	61 3	+ 3.5	79.9	37.5	42.4	9	3.340	...	...	...	...	0.26 lbs
1842	55.7	— 2.1	83.5	28.3	55.2	12	6.160	...	...	...	...	0.45 "
1843	59.1	+ 1.3	87.8	33.1	54.7	10	9.760	...	...	...	...	0.57 "
1844	58.6	+ 0.8	81.5	29.6	51.9	4	Imp.	...	...	...	...	0.26 "
1845	56.0	— 1.8	78.8	35.3	43.5	16	6.245	...	...	...	...	0.34 "
1846	63.6	+ 5 8	84.0	39.0	45.0	11	4.595	...	...	...	...	0.33 "
1847	55.6	— 2.2	74.8	38.1	36.7	15	6 665	...	...	...	...	0.33 "
1848	54.2	— 3.6	80.9	29.5	51.4	11	3.115	...	...	N 71 W	2.39	5.81 ms
1849	58.2	+ 0.4	80.6	33.5	47.1	9	1.480	...	...	N 75 W	0.69	4.23 "
1850	56.5	— 1.3	76.0	31.7	44.3	11	1.735	...	...	S 65 W	1.02	4.78 "
1851	60.0	+ 2 2	86.3	33.4	52.9	9	2.665	...	...	N 14 E	1.05	5.45 "
1852	57.5	— 0.3	81.8	36.1	45.7	10	3.630	...	...	N 77 W	0.57	4.60 "
1853	58.8	+ 1.0	85.4	36.1	49.3	12	5.140	...	...	N	1.06	4.33 "
1854	61.0	+ 3.2	93.1	36.3	56.8	14	5.375	...	...	N 22 W	1.33	4.04 "
1855	59.5	+ 1.7	81.7	36.1	45.6	12	5.585	...	...	N 20 E	1.29	7.61 "
1856	57.1	— 0.7	77.3	37.4	39.9	13	4.105	...	...	S 79 W	1.98	6.53 "
1857	58.6	+ 0.8	81.4	34.1	47.3	11	2.640	...	...	N 68 W	1.61	5.55 "
1858	59.1	+ 1.3	80.1	36.8	43.3	8	0.735	...	...	S 74 W	1.53	5.69 "
1859	55.2	— 2.6	73.8	35.7	38.1	15	3 525	...	...	N 44 W	1.60	6.36 "
1860	55.3	— 2.5	74.2	28.7	45.5	14	1.959	...	...	N 71 W	2.63	5.79 "
1861	59.1	+ 1.3	78 2	37.1	41.1	17	3.607	...	...	N 71 W	1.39	4.81 "
1862	59.6	+ 1.8	78.9	41.0	37.9	9	2.344	...	...	N 59 W	1.07	5.11 "
1863	55.9	— 1 9	78.2	31 6	46.6	8	1.235	...	...	N 16 W	0.92	6.46 "
1864	56.4	— 1.4	72.4	41.0	31.4	11	2 508	...	...	N 38 W	1.89	7.06 "
1865	64.5	+ 6.7	87.2	43.2	44.0	12	2.450	...	...	S 56 E	0 47	4.12 "
1866	55.2	— 2.6	78.2	35.3	42.9	15	5.657	...	...	N 33 W	1.45	4.63 "
Results to 1864	57.84	...	80.03	34.66	45.38	11.0	3.730	...	...	N 57 W	1.15	5 54
Exc. for 1866.	—2.62	...	—1.83	+0.64	—2.48	+ 4.0	+ 1.927	...	...	...	...	—0.91

C 2.3

THE

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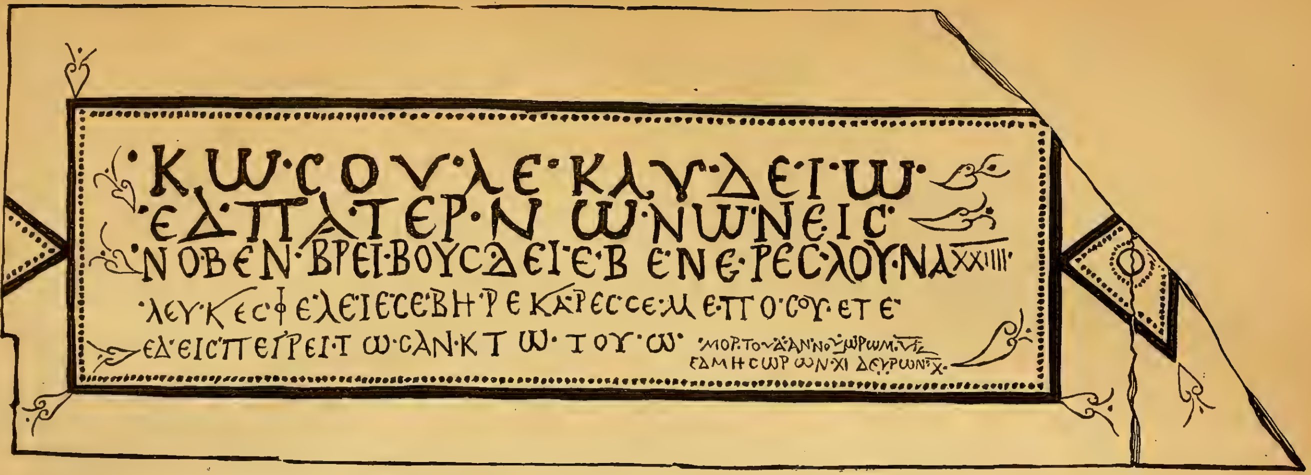
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·ΛΕΥ·ΚΕϹ·Φ·ΕΛΕΙΕϹΕΒΗ·ΡΕ ΚΑΡΕϹϹΕ·Μ Ε·ΠΤ Ο·ϹΟΥ·ΕΤΕ·
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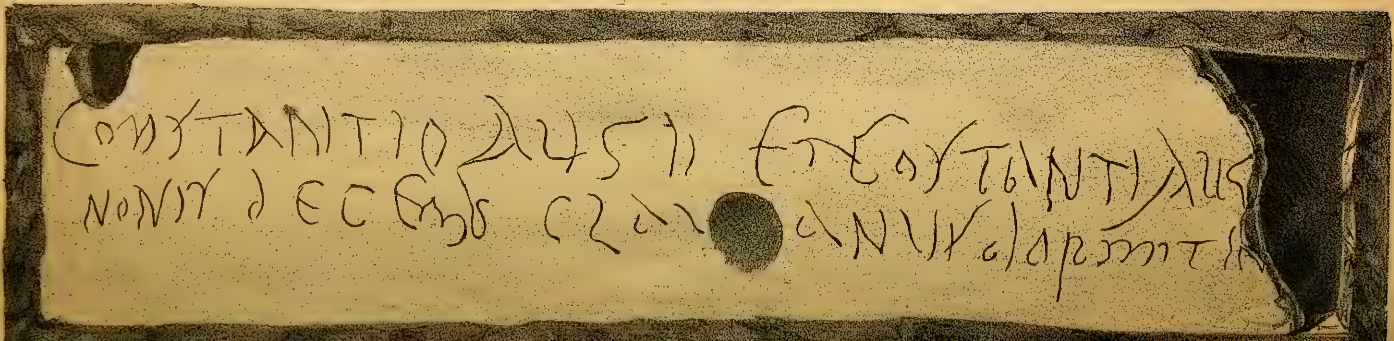
CONSTANTIO AUG II ET CONSTANTI AUG
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THE CANADIAN JOURNAL.

NEW SERIES.

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CHRISTIAN EPITAPHS OF THE FIRST SIX CENTURIES.

BY THE REV. JOHN McCAUL, LL.D.,
PRESIDENT OF UNIVERSITY COLLEGE, TORONTO, ETC.

THE following article contains the substance of a paper on the funereal inscriptions of the early ages of Christianity, that I read before the Canadian Institute, and, also, of a public lecture that I delivered on the same subject. I have availed myself of the opportunity, presented by its publication, to introduce many additional examples, and to arrange them all in classes. The selection of the inscriptions has been made without any controversial aim, and solely with a view to their forming a useful introduction to the study of Christian Archæology, so far as it is illustrated by the epitaphs of the first six centuries. I have limited myself to those inscriptions, within this period, that bear dates, so that there may be no question as to their age. No example has been given without *examination

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* No one, but those conversant with epigraphy, can fully appreciate the necessity for such examination. There are whole classes of inscriptions so justly suspected, that no scholar would accept one of them without the greatest caution; such, for example, are the Spanish, given under the name of Cyriac of Ancona, or on the authority of Morales or Occo, or the Italian, vouched for by Ligorio, a name of

of its genuineness; and I have invariably stated the place (when known) where each was found, with the authority both for this statement, and for the text that I have adopted. The inscriptions, that are given in the lithographic plates, are [†]*fac-similes* of the originals, as they are represented in De Rossi's work; the others are copied with as much accuracy as I could attain, using ordinary type. The notes are few and brief, as many of the difficulties are explained in the expansions and translations that I have given.

I subjoin a list of the editions of the principal works to which I refer in the article:—

ARINGHI,	*Roma Subterranea*, ...	*Lutetiæ Parisiorum*, 1659.
BOECKH,	*Corpus Inscriptionum Græcarum*, . .	Berlin, 1828–1856.

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itself sufficient to excite the strongest suspicion. Ligorio, a Neapolitan, was a practised forger of inscriptions, which he sold to collectors, and many of his impostures have been exposed by scholars. His work, however, was confined to imitation of the Heathen *tituli*. But there were others who took up the manufacture of Christian inscriptions. The celebrated epitaph on *Daciana Diaconissa*, who was "the daughter of Palmatus the Consul, and the sister of Victorinus the Presbyter, and prophesied many things," although it passed the ordeal of Maffei's fastidious scrutiny, is now known to have been forged, and has been traced to Ferrara. See De Rossi, p. xxx. Bosio's great work in Italian, on the Catacombs of Rome, was, as is well known, translated into Latin by Paul Aringhi, who made additions, to the original, contributed by himself and Severano. There is no doubt that a second Ligorio imposed on both of these scholars. See De Rossi, p. xxvi. Again, Boldetti, who published what may be regarded as a supplement to Bosio, was so deficient in scholarship and critical acuteness, and so regardless of accuracy, that no reliance can be placed on his copies, even of inscriptions that he himself saw. As this may appear to some to be too harsh a censure on a writer, whose authority was once held in high estimation, I subjoin one of the many adverse opinions pronounced on him by De Rossi, who was thoroughly acquainted with his work in all its details: *Hujus* (*scil.* Boldetti) *in id genus apographis excipiendis imperitiam et incuriam non centena, sed millena exempla testantur.* See p. 24.

Other authors might be mentioned in illustration of the necessity for examining the authority for each inscription; but, probably, enough has been said on the subject. It is a more agreeable duty to bear my testimony to the remarkable merits of Signor De Rossi's learned volume —*Inscriptiones Christianæ Urbis Romæ Septimo Sæculo Antiquiores*—a work, which is *facile princeps* of all that have been published on the subject.

[†] I have examined Perret's splendid volumes, but have not taken any extract from them. Their reputation for accuracy is not good; Burgon does not hesitate to call the work "simply *a Romance*."

Boldetti,	Osservazioni sopra i cimiterii de' SS. Martiri ed antichi christiani di Roma,	Roma, 1720.
Burgon,	"Letters from Rome,"	London, 1862.
Clinton,	*Fasti Hellenici* and *Fasti Romani*, . .	Oxford, 1834–1850.
De Rossi,	*Inscriptiones Christianæ Urbis Romæ Septimo Sæculo Antiquiores*, ...	*Romæ*, 1857–1861.
Fabretti,	*Inscriptionum Antiquarum explicatio*, .	*Romæ*, 1699.
Gruter,	*Inscriptiones Antiquæ*, ...	*Amsteledæmi*, 1707.
Henzen,	*Inscrip. Latin. Select. Collectio*, Orelli, iii.	*Turici*, 1856.
Kenrick,	"Roman Sepulchral Inscriptions," .	London, 1858.
Kip,	"The Catacombs of Rome," . . .	New York, 1859.
Kirchhoff,	*Corpus Inscriptionum Græcarum*, iv. 2, .	Berlin, 1859.
Mai,	*Veterum Scriptorum Nova Collectio*, .	*Romæ*, 1831.
Maffei,	*Museum Veronense*, ...	*Veronæ*, 1749.
Maitland,	"The Church in the Catacombs," .	London, 1847.
McFarlane,	"The Catacombs of Rome," . . .	London, 1852.
Mommsen,	*Inscriptiones Latinæ Antiquissimæ*, . .	Berlin, 1863.
Muratori,	*Novus Thesaurus Veterum Inscriptionum*,	*Mediolani*, 1739.
Northcote,	"The Roman Catacombs,"	London, 1857.
Orelli,	*Inscrip. Latin. Select. Collectio*, . . .	*Turici*, 1828.
Perret,	"Les Catacombes de Rome," . . .	Paris, 1852–1857.
Reinesius,	*Syntagma Inscrip. Antiquarum*, . . .	*Lipsiæ et Francofurti*, [1682.
Renier,	"Inscriptions Romaines de l'Algérie,"	Paris, 1858.

I. Those in which only the Name and Date are stated.

1.

VIBIV · FIMVS · R · VII KA · SEP
DIC · IIII · ET · MAX · COS

(*E* **coemeterio Callisti*; De Rossi, n. 16.)

Vibiu (Vibius) *Fimus recessit*, *VII Kalendas Septembres*, *Dicletiano* (Diocletiano) *IV et Maximiano Consulibus*.

"Vibius Fimus retired (from this world), on the seventh day before the Calends of September, in the Consulship of Diocletian for the fourth time, and Maximian [for the third time]," *i.e.* August 26th, 290, A.D.

De Rossi compares *Fimus* (dung) with the name *Stercorius*, commonly used by Christians. Thus, also, we find *Stercoria* applied to females. It is believed that such appellations were chosen by Christians in humility and self-abasement. I am inclined to think that, at least, some of them were not selected by those, who bore them, or by their relatives, but were applied by the heathen in contempt, and then adopted. We often meet with names common to both Christians and Pagans, and sometimes find the former strangely called after heathen deities, *e.g. Mercurius.*

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* *Coemeterium* is used to denote a "Catacomb," and the inscriptions, that have been found in the Catacombs, are distinguished by the term *coemeteriales*, although the words do not necessarily imply "subterranean."

I have followed De Rossi in reading R as *recessit;* others prefer *requiescit,* or *rediddit, sc.* animam. We should have had III after MAX, for Maximian was consul for the third time in the same year (290) in which Diocletian was consul for the fourth time.

2.

IGNATIVS · SEM
NVS
XV · KAL FEB
HANNIBALIANO
ETASCLEPIODO
TO COSS

(*In vinea supra coemeterium Petri et Marcellini;* De Rossi, n. 19.)

Ignatius Semnus, XV Kalendas Februarias, Hannibaliano et Asclepiodoto Consulibus.

"Ignatius Semnus, on the fifteenth day before the Calends of February, in the Consulship of Hannibalianus and Asclepiodotus," *i.e.* January 18th, 292, A.D.

There is an ellipsis of a word between *Ignatius Semnus* and *XV. Kal. Feb.* Either *decessit* or *depositus*—"died," or "was buried,"—may be supplied; of the two, the latter is the more probable in Christian epitaphs. A similar ellipsis is found in heathen sepulchral inscriptions. Thus, in the collection given by Lanzi, *Saggio,* i., p. 162, we have COIILIA A · D · X · KAL · DIIC, *i.e. Coelia ante diem X Kalendas Decembres, scil.* "Coelia, on November 22nd," whereby we should understand, that her bones were collected on that day. See Mommsen, *Inscrip. Latin. Antiq.,* p. 210. In his n. 887, we have P for *Positus,* and in n. 957, *ossiva, i.e. ossa.*

3.

(See Plate I, 2.)

(*E coemet. Theodoræ;* De Rossi, n. 55.)

Constantio Aug. II et Constanti (Constante) *Aug.* (*Conss.*) *Nonis Decemb. Clau*(*di*)*anus dormit in* (*pace.*)

"In the Consulship of Constantius Augustus, for the second time, and Constans Augustus, on the Nones of December (*i.e.* December 5th, 339, A.D.), Claudianus sleeps in peace."

4.

(See Plate II, 2.)

(*In Mus. Vat.;* De Rossi, n. 69.)

ΚΑΤΑΘΕCΙC ·
ΟΚΤΑΒΙΛΛΗC
ΠΡΟΘΚΑΛCΕΤ
ΡΩΜΟΥΛΙ

Κατάθεσις Ὀκταβίλλης πρὸ θ καλ(ανδῶν) Σετ(εμβρίων) Ῥωμούλι.

"The burial of Octavilla (took place) on the ninth day before the Calends of September [in the Consulship] of Romulus," *i.e.* August 24th, 343, A.D.

Ῥωμούλι, with the Latin ending of the genitive, stands for *Ῥωμούλου*, *i.e.* *ὑπατείᾳ Ῥωμούλου*.

5.

GAVDENTIVS · DIE · III · KAL
AVG · SERGIO · ET · NIGRINIANO ·
COSS

(*E coemeterio Hippolyti;* De Rossi, n. 109.)

Gaudentius, die III Kalendas Augustas, Sergio et Nigriniano Consulibus.

"Gaudentius, on the third day before the Calends of August, in the Consulship of Sergius and Nigrinianus," *i.e.* July 30th, 350, A.D.

6.

DEPOSTIO SEDATI XII KAL
DECEMBRES · GRAT ANOV
ET TODOSIO CONSS

(*In coem. Theodoræ;* De Rossi, n. 291.)

Depostio (depositio) *Sedati, XII Kalendas Decembres, Gratiano V et Todosio* (Theodosio) *Consulibus.*

"The burial of Sedatus (took place) on the twelfth day before the Calends of December, in the Consulship of Gratianus, for the fifth time, and Theodosius," *i.e.* November 20th, 379, A.D.

I have regarded *depositio* as "burial." There are examples of its use, in which it might be considered as standing for the place, or for the body itself.

7.

DEPOSITVS LEONEDES IN PACE
D IIII NONAS APRIL POST $\overline{\text{CONS}}$
IOANNIS ET VARANA

(*In S. Agnetis extra Muros;* De Rossi, n. 799.)

Depositus Leonedes (Leonides) *in pace, die IV Nonas Apriles, post consulatum Joannis et Varana* (Varanæ or Varanis).

"Leonidas was buried in peace on the fourth day before the Nones of April, (in the year) after the Consulship of John and Varanes," *i.e.* April 2nd, 457, A.D.

I have uniformly translated *depositus* by our ordinary word, "buried." There are some, who think that it is used with a special reference to the resurrection. Thus Northcote, "The Roman Catacombs," p. 143, remarks: "Each body, as it was laid in its grave, was said to be *depositum* there; deposited, that is, only for a while, to be reclaimed again in that day when the sea and the earth shall give up their dead." This is a pleasing, but, in my judgment, incorrect interpretation. The word *depositus*, meaning "laid down," is used by Classical authors in the sense "despaired of," and "dead." See Virgil, *Æn.*, xii., 395; Ovid, *Trist.*, iii., 3, 40; *Ex Pont.*, ii., 47.

In Christian inscriptions, I regard it as signifying no more than "laid down," *i.e.* that the body (*corpus integrum*)—not merely portions of it, as was common among the heathen—was "buried."

II. THOSE IN WHICH ONLY THE NAME, AGE, AND DATE ARE STATED.

8.

SERVILIA · ANNORVM · XIII ·
PIS · ET · BOL · COSS ·

(*E coemeterio Lucinæ;* De Rossi, n. 3.)

Servilia, annorum XIII, Pisone et Bolano Consulibus.

"Servilia, of thirteen years (of age), in the Consulship of Piso and Bolanus," *i.e.* 111, A.D.

This inscription has no distinctive mark of a Christian epitaph; and yet the circumstances, under which it was found in the Catacombs, seem to warrant its being placed among them. See De Rossi, n. 3.

9.

ΕΡΜΕΙΑCΟΚΑΙ
ΛΙΤΟΡΙCΜΗ̅Μ̅Γ̅Ε
HI̅Λ̅MIAS QVIET
LITORIVS M V̅I̅I̅I̅
DIERX̅V̅ EXCESSIT
ALBINO I̅I̅ ETMAXI
MO COS XIIII KAPBH

(*Smyrnæ;* Boeckh, *Corp. Inscrip. Græc.*, n. 3309.)

Ἑρμείας ὁ καὶ Λίτορις μ(ηνῶν)η̄ [ἡ]μ(ερῶν)[ι]ε. *Hermias, qui et Litorius, mensium VIII, dierum XV, excessit, Albino II et Maximo Consulibus, XIV Kalendas Apriles.*

"Hermias, who was also called Litorius, of eight months, fifteen days (of age), departed in the Consulship of Albinus for the second time, and Maximus, on the fourteenth day before the Calends of April," *i.e.* March 19th, 263, A.D.

If this be a Christian epitaph, as it probably is, it is more ancient than any of those, not found in Rome, that bear dates. We must read in line 3, HERMIAS; and in line 7, K·APRIL. See De Rossi, p. 15.

10.

(See Plate II, 3.)

(*E coemet. via Ardeatina;* De Rossi, n. 13.)

(Αὐ)ρηλία Παῦλα . . . . α ἐγεννήθη Α(ὐρηλιανῷ) (τὸ β̄) καὶ Καπιτωλείνῳ (ὑπάτοις) τελευτᾷ πρὸ η̄ καλανδῶν . . . . ω ἔζησεν ἔτη δύο (ἡμέρας) δέκα πέντε.

"Aurelia Paula . . . . was born in the Consulship of Aurelian for the second time, and Capitolinus (*i.e.* 274, A.D.) She dies on the eighth day before the Calends of . . . . She lived two years fifteen days."

The date of her death was 277, A.D.

11.

HIC · IACET · MVSCVLA · QUAE ET · GALATEA
QVAE VIX · ANN · DVOB · MENS · DVOB · ET DXVII
DEP · XV · KAL · AVG · GRATIANO AVG · II ET
PROBO CONSS · IN PACE

(*E coemeterio Lucinæ;* De Rossi, n. 224.)

Hic jacet Muscula, quæ et Galatea, quæ vixit annis duobus, mensibus duobus, et diebus XVII. Deposita XV Kalendas Augustas, Gratiano Augusto II et Probo Consulibus, in pace.

"Here lies Muscula, who was also called Galatea, who lived two years, two months, and seventeen days. Buried on the fifteenth day before the Calends of August, in the Consulship of Gratianus Augustus for the second time, and Probus (*i.e.* July 18th, 371, A.D.), in peace."

It has been suggested that *Galatea* may have been the Heathen, and *Muscula* the Christian, name of the deceased. Thus we find in ***Reinesius***, n. 452: ***Accia vel Maria est nomen mihi Tulliana, i.e.*** her heathen name was ***Accia***, but her Christian, ***Maria***. This notice, however, of two names is not rare in heathen epigraphy. Perhaps *Muscula* was her pet name. In the text, I have adopted, in the third line, De Rossi's reading of ET for IT. The use of the ablative for time "how long," is common in inscriptions. Sometimes we have the two constructions in the same sentence, as in n. 34.

12.

TIBVRTIVS QVI VIXIT ANN · XXVI · ET MENS ·
VIIII · DXI · DEP · VII · NON · DEC · DN · GRATI
ANO IIII · ET MEROBAVDE COSS · IN PACE

(*Ad S. Agnetis;* De Rossi, n. 268.)

Tiburtius, qui vixit annos XXVI et menses IX, dies XI. Depositus, VII Nonas Decembres, Domino Nostro Gratiano IV et Merobaude Consulibus, in pace.

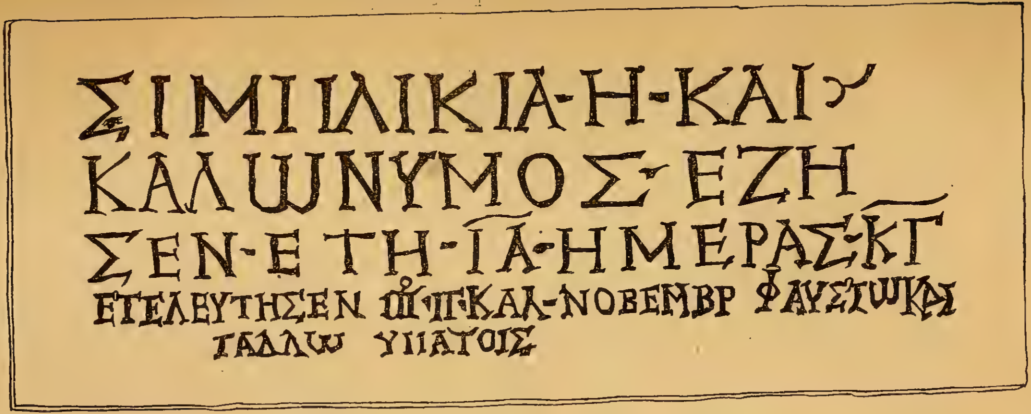
"Tiburtius, who lived twenty-six years, and nine months, (and) eleven days. Buried on the seventh day before the Nones of December, in the Consulship of our Lord Gratianus for the fourth time, and Merobaudes (*i.e.* November 29th, 377, A.D.), in peace."

l. 2. VII · NON · DEC. I have regarded this as = III · KAL · DEC. Thus we have in De Rossi, n. 442, VIII · X · (XVIII) KL · MART, *i.e.* PRID · ID · FEB ·; and in n. 587, XVIII KALENDAS NOBEMBRES, *i.e.* ID · OCTOB.

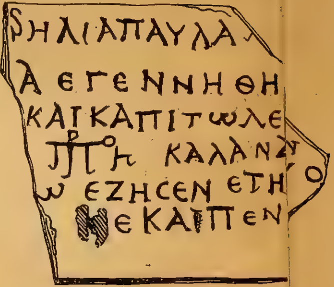
13.

IC POSITVS ETS LEO QVI
VIXIT ANNOS · XXVI DI
POSITUS · VIII · IDVS · O
CTOBRIS · NATVS EST
TAVRO · ET · FLORENTIO
CCSS

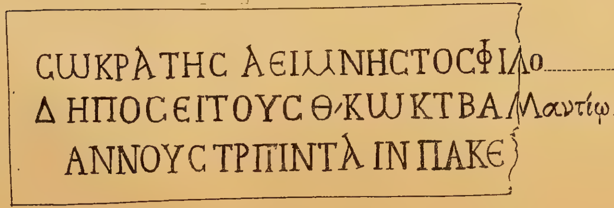
(*In Bibliotheca S. Gregorii*—Marini; De Rossi, n. 362.)


ΣΙΜΙΛΙΚΙΑ·Η·ΚΑΙ
ΚΑΛΩΝΥΜΟΣ·ΕΖΗ
ΣΕΝ·Ε ΤΗ·ΙΑ·ΗΜΕΡΑΣ·ΚΓ
ΕΤΕΛΕΥΤΗΣΕΝ ΠΡ·ΙΓ·ΚΑΛ·ΝΟΒΕΜΒΡ ΦΑΥΣΤΩ ΚΑΙ
ΓΑΛΛΩ ΥΠΑΤΟΙΣ

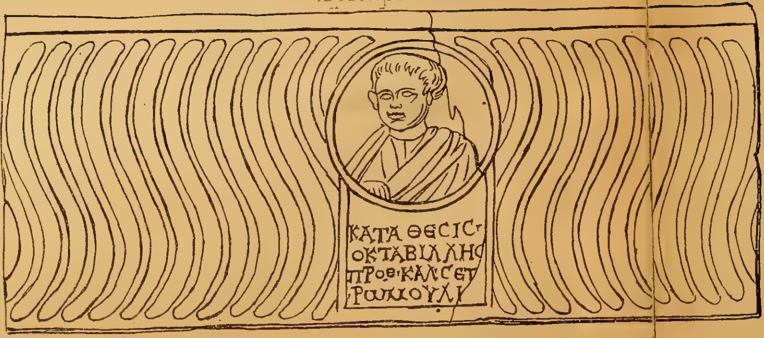
3.
Epitaph No 10.


ϚΗΛΙΑΠΑΥΛΑ
Α ΕΓΕΝΝΗΘΗ
ΚΑΙ ΚΑΠΙΤΩΛΕ
ΠΡΟ Η ΚΑΛΑΝΔ
Ω ΕΖΗϹΕΝ ΕΤΗ Ο
ΕΚΑΙ ΠΕΝ

Epitaph No 18.


ϹΩΚΡΑΤΗϹ ΑΕΙΜΝΗϹΤΟϹ ΦΙΛΟ
Δ ΗΠΟϹΕΙΤΟΥϹ Θ·ΚΩ ΚΤ ΒΑ Μαντίω
ΑΝΝΟΥϹ ΤΡΙΠΙΝΤΑ ΙΝ ΠΑΚΕ

Epitaph No 4


ΚΑΤΑ ΘΕϹΙϹ
ΟΚΤΑΒΙΛΛΗϹ
ΠΡΟ Θ ΚΑΛ ϹΕΤ
ΡΩΜΟΥΛΙ

W. C. Chewett & Co. Lith., Toronto.

(H) *ic positus ets* (est) *Leo, qui vixit annos XXVI. Dipositus* (depositus) *VIII Idus Octobres, natus est Tauro et Florentio Consulibus.*

"Here has been laid Leo, who lived twenty-six years. Buried on the eighth day before the Ides of October. He was born in the Consulship of Taurus and Florentius," *i.e.* 361, A.D.

As Leo was twenty-six years of age at his death, it it evident that this epitaph is of the date, October 8th, 386, A.D.

14.

HIC REQVIESCET IN SOMNO PACIS
MALA QVI VIXIT ANNOS XXXVIII · M · V · DV ·
ACCEPTA APVT DE IV · IDVS IVNIAS AETIO CONL'.

(*E fundamentis vet. bas. Vaticanæ;* De Rossi, n. 678.)

Hic requiescet (requiescit), *in somno pacis, Mala qui* (quæ) *vixit annos XXXVIII, menses V, dies V. Accepta aput* (apud) *De(um) IV Idus Junias Aetio Consule.*

"Here rests, in the sleep of peace, Mala, who lived thirty-eight years, five months, five days. Received before God, on the fourth day before the Ides of June, in the Consulship of Aetius," *i.e.* June 10th, 432, A.D.

l. 1. *Requiescet.* As if it were of the second conjugation: similarly *quiescet* and *requiescent*, for *quiescit* and *requiescunt.* In Gruter, 998, 10, we have *Hic requiescent,* in a heathen inscription, said of the living, *i.e.* we have the ordinary future.

15.

ΕΝΘΑΛΕΚΙΤΕΕΝ
ΕΙΡΗΝΗΜΑΡΙΑ
ΕΖΗ[ΕΝΕΤΗ . .
ΚΡΟΠΡΟCΒ . .
ΕΤΕΛΙΩΘΗ Ιου
ΛΙΟΥ$\overline{\text{ΚS}}$ΥΠ
ΑΦΛSΦΑSC . . .

(*Rhegii;* Kirchhoff, n. 9541.)

Ἐνθάδε κῖτε (κεῖται) ἐν εἰρήνῃ Μαρία. Ἔζησεν ἔτη [μι]κρὸ(ν) πρὸς $\overline{\beta}$. Ἐτελιώθη (ἐτελειώθη) Ἰουλίου $\overline{\kappa\varsigma}$ ὑπ[ατί]α̣ Φ.[Ἄ]σ[π]α[ρος].

"Here lies in peace, Mary. She lived a little more than two years. She finished her course on the twenty-sixth of July, in the Consulship of Flavius Aspar," *i.e.* 434, A.D.

I have given Kirchhoff's reading and expansion. Corsini read the last line thus: Φ. Aς. Φ. ASC, *i.e. Flavii Ariovindi et Flavii Asparis*, giving the names of the two consuls. De Rossi suggests: ΦAς ΦAYCTου, *i.e. Flavii Fausti*, or 490, A.D.

III. Those in which some Characteristic of the Deceased is Stated.

16.

(See Plate II, 1.)

(*E coemeterio Laurentii;* De Rossi, n 23.)

Σιμπλικία ἣ καὶ Καλώνυμος ἔζησεν ἔτη ι̅α̅ ἡμέρας κ̅γ̅ ἐτελεύτησεν πρὸ ι̅γ̅ καλ. Νοβεμβρίων Φαύστῳ καὶ Γάλλῳ ὑπάτοις.

"Simplicia, who was also rightly so named, lived eleven years, twenty-three days, died on the thirteenth day before the Calends of November, in the Consulship of Faustus and Gallus," *i.e.* October 20th, 298, A.D.

These consuls were Anicius Faustus, for the second time, and Virius Gallus. See De Rossi, p. 28, and Clinton, *Fasti Romani*, ii., 194. Ἣ καὶ, like the Latin *quæ et*, is frequently used to signify "who also was called." Here I have taken καλώνυμος as an adjective, as it has been understood by Montfaucon, Kirchhoff, and De Rossi. The signification is, that her name, *Simplicia*, was a true indication of her habits and manners.

17.

INNOCENTISSIMO · PAVLO
QVI · VIX · M · X · D · XIIII · DEPOSIT · PRID
NON · DECE · IN PACE · COSTANTIO · III · ET
COSTATE · II · CONS ·

(*E coem. Prætextati;* De Rossi, n. 67.)

Innocentissimo Paulo, qui vixit menses X, dies XIV. Depositus, pridie Nonas Decembres, Constantio III et Costate (Constante) *II Consulibus.*

"To the very innocent Paul, who lived ten months, fourteen days. Buried on the day before the Nones of December, in the Consulship of Constantius for the third time, and Constans for the second time," *i.e.* December 4th, 342, A.D.

18.

(See Plate II, 4.)

ϹΩΚΡΑΤΗϹ ΑΕΙΜΝΗϹΤΟϹ ΦΙΛο . . . . .
ΔΗΠΟϹΕΙΤΟΥϹ ΘΚΩΚΤΒΑΜ . . . . .
ΑΝΝΟΥϹΤΡΙΓΙΝΤΑ ΙΝ ΠΑΚΕ

(*E coem. Cyriacæ;* De Rossi, n. 85.)

Σωκράτης ἀείμνηστος φιλο . . . . depositus $\overline{\theta}$ (*IX*) *Kalendas Octobres Am*antio et Albino Consulibus, vixit *annus* (annos) *triginta in pace.*

"Socrates, ever to be remembered . . . buried on the ninth day before the Calends of October, in the Consulship of Amantius and Albinus" (*i.e.* September 23rd, 345, A.D.). He lived thirty years, in peace."

19.

BONOSO BENE · MERENTI IN PACE
QVI VIXIT ANNIS · II · M · III · D · XX
DEP PRID · IDVS · SEPT · POST
CONSS · AMANTI ET ALBINI

(*Velitris;* De Rossi, n. 92.)

Bonoso bene merenti, in pace, qui vixit annis II, mensibus III, diebus XX. Depositus, pridie Idus Septembres, post consulatum Amantii et Albini.

"To Bonosus, well-deserving, in peace, who lived two years, three months, twenty days. Buried on the day before the Ides of September (*i.e.* September 12th), (in the year) after the Consulship of Amantius and Albinus," *i.e.* 346, A.D.

l. 1. *Bene Merenti.* This was a very general characteristic of the deceased, both in heathen and Christian epitaphs. It is frequently contracted thus: B · M · See n. 33.

20.

ΕΝΘΑΔΕ ΚΕΙΤΕ
ΕΥΤΕΡΠΗ Η ΤΩΝ
ΜΟΥϹΩΝ ϹΥΝΤΡΟΦΟϹ
ΒΙΩϹΑϹΑ ΑΠΛΩϹ ΚΑΙ
ΟϹΕΙΩϹ ΚΑΙ ΑΜΕΜ
ΠΤΩϹ ΕΠΙ ΕΤ ΙΕ
ΕΙΜ $\overline{\text{ΚΒ}}$ ΜΗΝ $\overline{\text{Γ}}$
ΕΤΕΛΕΥΤΗ ΠΡΟ $\overline{\text{Ε}}$ ΚΑΛ
ΔΕΚΕΜΒ ΥΠΑΤΙΑ
ΤΩΝ $\overline{\text{ΚΥ}}$ ΤΟ $\overline{\text{Ι}}$ ΚΑΙ ΤΟ $\overline{\text{Γ}}$

(*Prope Motycam* (in Sicilia); Kirchhoff, n. 9524.)

Ἐνθάδε κεῖτε (κεῖται) Εὐτέρπη ἡ τῶν Μουσῶν σύντροφος βιώσασα ἁπλῶς καὶ ὁσείως (ὁσίως) καὶ ἀμέμπτως ἐπὶ ἔτη ι̅ε̅, ἡμέρας κ̅β̅, μῆνας γ̅. Ἐτελεύτησεν τῇ πρὸ ε̅ καλανδῶν Δεκεμβρίων ὑπατίᾳ τῶν κυρίων τὸ ι̅ καὶ τὸ γ̅.

"Here lies Euterpe, the companion of the Muses, having lived simply, and piously, and irreproachably, for fifteen years, twenty-two days, three months. She died on the fifth day before the Calends of December, in the Consulship of our Lords, for the tenth time, and for the third time," (*i.e.* in the Consulship of Constantius, for the tenth time, and Julian, for the third time), *i.e.* November 27th, 360, A.D.

The abbreviation, whereby the names of the Emperors, or of the Emperor and the Cæsar, were omitted, and merely the numbers of their Consulships stated, is rare in Christian inscriptions. The most obvious example of it in heathen *tituli*, is—TER ET SEMEL COSS, *i.e.* 202, A.D., in which Severus was Consul for the third time, and Caracalla for the first.

21.

HIC POSITA EST ANIMA DVLCES
INNOCA SAPIENS ET PVLCHRA NOMINE
QVIRIACE QVE VIXIT · ANNOS · III · M · III · DVIII
DP IN PACE IIII · ID · IAN · CONSS · DN · TEVDOSIO · AVG · II
ET MEROBAVDE · VC · III ·

(*In Mus. Lat.;* De Rossi, n. 370.)

Hic posita est anima dulces (dulcis), *innoca* (innocua), *sapiens et pulchra, nomine Quiriace, quæ vixit annos III, menses III, dies VIII. Deposita in pace, IV Idus Januarias, Consulibus Domino Nostro Tendosio* (Theodosio) *Augusto II et Merobaude, Viro Clarissimo, III.*

"Here has been laid a sweet spirit, guileless, wise, and beautiful, by name Quiriace, who lived three years, three months, eight days. Buried, in peace, on the fourth day before the Ides of January, in the Consulship of our Lord Theodosius Augustus, for the second time, and Merobaudes, a most distinguished man, for the third time," *i.e.* January 10th, 388, A.D.

The name *Quiriace* is another form of *Cyriace*, both being Κυριακὴ Latinized.

There is great difficulty as to the junction of *Merobaudes* with *Theodosius*, in the second consulship of the latter. The *Fasti*, laws, and public acts mention, in his place, *Cynegius*. The best solution, of which I am aware, is that proposed by De Rossi in his note.

22.

HIC REQVIESCET QVODVVLDEVS HO
NESTERECORDATIONES VIR OVI VIC
XIT ANNOS · L · ϛI DEPOSITVS IN PACE
DIE V IDVS OCTOBRES $\overline{\mathrm{CONSS}}$ $\overline{\mathrm{DD}}$ $\overline{\mathrm{NN}}$
ARCADIO $\overline{\mathrm{AVG}}$ QVATER ET HONO
RIO $\overline{\mathrm{AVG}}$ TER CONSVLIBVS

(*In Mus. Lat.;* De Rossi, n. 436.)

Hic requiescet (requiescit) *Quodvuldeus* (Quodvultdeus), *honeste* (honestæ) *recordationes* (recordationis) *vir, ovi* (qui) *vicxit* (vixit) *annos LVII. Depositus in pace, die V Idus Octobres, Consulibus Dominis Nostris Arcadio Augusto quater et Honorio Augusto ter Consulibus.*

"Here rests *Quodvultdeus*, a man worthy to be remembered with honor, who lived fifty-seven years. Buried, in peace, on the fifth day before the Ides of October, in the Consulship of our Lords Arcadius Augustus, for the fourth time, and Honorius Augustus, for the third time," *i.e.* October 11th, 396, A.D.

Christians assumed such names as *Adeodatus*, *Deusdedit*, *Quodvultdeus*.

23.

ΕΝΘΑΔΕ ΚΕΙΤΑΙ ΕΥΤΥΧΙΑΝΟΣ
ΖΗϹΑϹ ΕΝ ΧΩ ΤΕΛΕΥΤΑΤΗΠΡΘ
ΚΑΛΑΝΔΩΝ ΑΥΓΟΥϹΤΩΝ ΥΠ
ΑΝΙΚΙΟΥ ΑΥΧΕΝΙΟΥ ΒΑϹϹΟΥΚ
ΦΛΙΦΛΙΠΠΟΥ

(*Acris prope Syracusas;* Kirchhoff, n. 9478.)

Ἐνθάδε κεῖται Ἐυτυχιανὸς ζήσας ἐν Χριστῷ. Τελευτᾷ τῇ πρὸ $\overline{\theta}$ Καλανδῶν Αὐγούστων ὑπατίᾳ Ἀνικίου Αὐχενίου Βάσσου καὶ Φλ. Φιλίππου.

"Here lies Eutychianus, having lived in Christ. He dies on the ninth day before the Calends of August, in the Consulship of Anicius Auchenius Bassus, and Flavius Philippus," *i.e.* July 24th, 408, A.D.

24.

GVLFINVS · FAMVLVS · DEI
VIXIT · ANNOS · PLVS · MINVS · LXX
RECESSIT · IN · PACE D · III · KAL
AVGVSTAS · ERA · D

(*Hispali;* Maffei, *Mus. Ver.*, 423, 3.)

Gulfinus, famulus Dei, vixit annos plus minus LXX. Recessit in pace, die III Kalendas Augustas, era D.

"Gulfinus, a servant of God, lived seventy years, more or less. He retired (from this world), in peace, on the third day before the Calends of August, in the 500th year of the æra," *i.e.* July 30th, 462, A.D.

The Spanish æra counts from January 1st, 38, B.C. There are many examples of its use. The oldest that I have observed is that given above.

25.

AETERNALIS FA
MVLVS DEI VIXIT
AN · XLVI · REQ · IN
PAC · VI · KAL · SE
PTEM ERA DNI
D · XLVIII

(*Galistei in Lusitania, ex Emerita;* Muratori, 1821, 9.)

Æternalis, famulus Dei, vixit annos XLVI, requiescit in pace, VI. Kalendas Septembres, era Domini DXLVIII.

"Æternalis, a servant of God, lived forty-six years, rested in peace on the sixth day before the Calends of September, in the 500th year of the æra of (our) Lord," *i.e.* August 27th, 510, A.D.

I have given this example on account of the use of DNI, which is not common. If we had ANNO DNI, it would, of course, refer to the Christian, or Dionysian, æra; but this is said to have been first used in the year of Christ, 525. As it stands, DNI = *Domini* means Augustus, referring to his subjugation of Spain. Or, is DNI a contraction of *Dominii, i.e.* of Roman rule?

IV. THOSE IN WHICH THE RELATIONSHIP OF THE DECEASED IS STATED.

(*a.*) To a father:— 26.

LEOPARDO PATRI DVLCISSIMO
BENEMERENTI IN PACE DEP
DIE XV · KAL · IAN · CONSTANTIO VIII
ET IVLIANO CAES · CONS

(*Ad S. Agnen.;* De Rossi, n. 130.)

Leopardo, patri dulcissimo, benemerenti in pace. Depositus, die XV Kalendas Januarias, Constantio VIII et Juliano Cæsare Consulibus.

"To Leopardus (our, or my) sweetest father, well-deserving, in peace. Buried on the fifteenth day before the Calends of January, in the Consulship of Constantius, for the eighth time, and Julianus Cæsar," *i.e.* December 18th, 356, A.D.

The terms designating animals were commonly applied as names of persons, both by pagans and by Christians, who, also, were in the habit of using figures of those animals as representatives, as in modern heraldry we have "canting arms," *armes parlantes.* Thus, in the Catacombs, we find a lion for a man named *Leo*, a little pig for a girl named *Porcella*, with the object, as is believed, of enabling those who could not read, to distinguish the *loculus* of a friend or relative.

(*b.*) To a mother:— 27.

TIGRITI BEMEMERIII IN PACE
QVE VICSIT ANNOS · XXX
MEN · II · DEPOSITA · VIII · KAL
IAN · DD · NN · TEVDOSIO · III · ET
EVGENIO
EILIVS EECEI MATRI

(*In Lat.;* De Rossi, n. 414.)

Tigriti (Tigridi) *benemeriii* (benemeritæ), *in pace, que* (quæ) *vicsit* (vixit) *annos XXX, menses II. Deposita, VIII Kalendas Januarias, Dominis Nostris Teudosio* (Theodosio) *III et Eugenio. Eilius* (filius) *eecei* (feci) *matri.*

"To Tigris, well-deserving, in peace, who lived thirty years, two months. Buried on the eighth day before the Calends of January, (in the Consulship of) our Lords Theodosius, for the third time, and Eugenius" (*i.e.* December 25th, 393, A.D.). I, (her) son, made (this) for (my) mother."

(*c.*) To a husband:— 28.

DEPOSSIO IVNIANI PRI · IDVS APRILES MARCELLINO
[ET PROBINO CONSS ·
QVI BIXIT ANNIS XL IN PACE RECESSIT ET AMATOR
[PAVPERORVM VIXIT
CVM BRGINIA ANNIS · XV · BENEMERENTI BIRGINIA SVA
[BICTORA
BENEMERENTI FECIT AMATRIX PAVPERORVM ET
[OPERARIA

(*In Mus. Lat.;* De Rossi, n. 62.)

Depossio (depositio) *Juniani, pridie Idus Apriles, Marcellino et Probino Consulibus, qui bixit* (vixit) *annis* (annos) *XL. In pace decissit* (decessit) *et amator pauperorum* (pauperum), *vixit cum brginia* (virginia) *annis* (annos) *XV. Bene merenti, birginia* (virginia) *sua Bictora* (Victoria), *bene merenti, fecit amatrix pauperorum* (pauperum) *et operaria.*

"The burial of Junianus (took place) on the day before the Ides of April, in the consulship of Marcellinus and Probinus (*i.e.* April 12th, 341, A.D.), who lived forty years. He departed, in peace, and (was) a lover of the poor. He lived with his wife fifteen years. To him, well-deserving, his wife Victoria, a lover of the poor, and attentive to her work, made (this) to him well-deserving."

l. 3. *Brginia* = *Virginia* = a wife, who was a maiden when married. Thus, also, *Virginius* = *Maritus.* l. 4. *Operaria* = industrious. This praise of a female is found in heathen epitaphs. Thus, *lanam fecit*, Gruter, 769, 9; *lanifica*, Orelli, 4658; and *καὶ ἐργάτις*, Boeckh, *Corp. Inscrip. Græc.*, 954.

29.

LIMENIO · ET · CATVLINO · CONSS · III ·
IDVS · IANVARIAS · DEFVNCTVS · EST
EVVODIVS · QVI · VIXIT · ANNOS · LXV
MENSES · TRES · ET · DIES · XI · BENEME
RENTI · IN PACE FECIT · CONIVX

(*E coem. Prætextati;* De Rossi, n. 104.)

Limenio et Catulino Consulibus, III Idus Januarias, defunctus est Evvodius qui vixit annos LXV, menses III, et dies XI. Benemerenti in pace fecit conjux.

"In the Consulship of Limenius and Catulinus (*i.e.* 349, A.D.), on the third day before the Ides of January (*i.e.* January 11th), Evodius died, who lived sixty-five years, three months, and eleven days. His wife made (this) to him, well-deserving, in peace."

30.

FELIX SANCTAE · FIDEI · VOCITVS · IIT IN PACE ·
CVIVS · TANTVS AMOR · ET CARITAS · RETENETVR · AB
[AMICIS IN AEVO
QVI CVM ESSET FVIT SOLACIVS · MISERICORS · OMNIBVS
AGRIPPINA FECIT · DVLCISSIMO SVO MARITO [NOTVS ·
CVM QVEM VIXIT SINE LESIONE ANIMI · ANNOS $\overline{\text{III}}$ ·
[ET $\overline{\text{M}}$ · X ·
FVIT IN SAECVLVM QUOD VIXIT · ANNOS XXXII · DEP · XIII ·
[KAL · SEPT · VALENTINIANO
NP ET VICTORI CONSS

(*E basilica Vaticana;* De Rossi, n. 211.)

Felix, sanctæ fidei, vocitus (vocatus) *iit in pace, cujus tantus amor et caritas retenetur* (retinetur) *ab amicis: in ævo qui cum esset fuit solacius, misericors, omnibus notus. Agrippina fecit dulcissimo suo marito, cum quem* (quo) *vixit sine lesione* (læsione) *animi annos III et menses X. Fuit in sæculum* (sæculo), *quod* (quoad) *vixit, annos XXXII. Depositus, XIII Kalendas Septembres, Valentiniano, Nobilissimo puero, et Victori* (Victore) *Consulibus.*

"Felix, of sacred honor, (when) called (away) went in peace, whose love and affection are so warmly cherished by his friends: who, when he was in life, was known to all for sympathy with the afflicted, and compassion towards the distressed. Agrippina made (this) to her very sweet husband, with whom she lived, without jarring, three years and ten months. He was in this world, whilst he lived, thirty-two years. Buried on the thirteenth day before the Calends of September, in the Consulship of Valentinianus, the most noble boy, and Victor," *i.e.* August 20th, 369, A.D.

l. 1. *Sanctæ fidei.* Literally "holy faith," but the meaning seems to be "of sacred honor," "of strict integrity." *Vocitus* for *vocatus*, as *probitus, rogitus.* l. 5. *Sine læsione animi.* Northcote, "Roman Catacombs," p. 137, seems to regard such statements of conjugal harmony, as peculiar to Christian inscriptions; but this eulogy is often found in heathen epitaphs, both from husbands to wives, and *vice versa.* Other forms of it are *sine querela, sine jurgio, sine dissidio.* Hence, Kenrick, "Roman Sepulchral Inscriptions," p. 42, justly remarks: "The married life of the Romans appears to have been remarkably free from domestic differences." l. 7. *Nobilissimo puero. Nobilissimus* was the term applied to the *Cæsar* from the time of Commodus and Severus; but, in the fourth century, it was extended in its use.

31.

MIRE · SAPIENTIAE
AVGENDO QVI VIXIT
ANN PLVS MIN · LXXII
CVM VXORE FECIT
ANN XXX DEPOSITVS
XVI · KAL OCTOB DN GRA
TIANO AVG · II ET PROBO CON̄

(*Neapoli, in Mus. Borbon.*; De Rossi, n. 225.)

Mire (miræ) *sapientiæ Augendo, qui vixit annos plus minus LXXII. Cum uxore fecit annos XXX. Depositus, XVI Kalendas Octobres, Domino nostro Gratiano Augusto II et Probo Consulibus.*

"To Augendus, of wonderful wisdom, who lived seventy-two years, more or less. He passed thirty years with his wife. Buried on the sixteenth day before the Calends of October, in the Consulship of our Lord Gratian Augustus, for the second time, and Probus," *i.e.* September 16th, 371, A.D.

l. 4. ***Fecit. Facere*** is often used in the sense "to spend," "to pass," in Christian epitaphs; and this signification is not peculiar to them.

32.

APRO · QVI · VIXIT · ANNOS XLVIII · MENSES III · DIES
XVI : DEPOSITVS IN PACE VI · KALENDAS MARTIAS
POST CONS · GRATIANI ET EQVITII · LIMFIRIA MARITO
FECIT MECVM ANNOS XX ·

(*E coem. Callisti.;* De Rossi, n. 248.)

Apro, qui vixit annos XLVIII, menses III, dies XVI. Depositus in pace, VI Kalendas Martias, post consulatum Gratiani et Equitii Limfiria marito. Fecit mecum annos viginti.

"To Aper, who lived forty-eight years, four months, sixteen days. Buried, in peace, on the sixth day before the Calends of March, in the year after the Consulship of Gratianus and Equitius (*i.e.* February 24th, 375, A.D.). Limfiria to her husband. He passed twenty years with me."

(*d.*) To a wife:—

33.

B M
CVBICVLVM · AVRELIAE · MARTINAE CASTISSIMAE AD-
[QVE · PVDI
CISSIMAE FEMINAE QVE FECIT · INCONIVGIO ANN ·
[XXIII D XIIII
BENEMERENTI · QVEVIXIT · ANN · XL · M · XI · D · XIII
[DEPOSITIO EIVS
DIE · III · NONAS · OCT · NEPOTIANO · ET FACVNDO CONSS ·
[IN PACE

(*In Mus. Lat.;* De Rossi, n. 45.)

Bene merenti. *Cubiculum Aureliæ Martinæ, castissimæ adque* (atque) *pudicissimæ feminæ, que* (quæ) *fecit in conjugio annos*

XXIII, dies XIV. Bene merenti que (quæ) *vixit annos XL, menses XI, dies XIII. Depositio ejus, die III Nonas Octobres, Nepotiano et Facundo Consulibus. In pace.*

"To (one) well-deserving. The sleeping-place of Aurelia Martina, a most chaste and modest woman, who passed in wedlock twenty-three years, fourteen days. To her, well-deserving, who lived forty years, eleven months, thirteen days. Her burial (took place) on the third day before the Nones of October, in the Consulship of Nepotianus and Facundus, (*i.e.* October 5th, 335, A.D.). In peace."

l. 1. *B. M.* These letters stand sometimes for *bene merenti,* sometimes for *bonæ memoriæ,* never for *beatus* or *beata martyr* (as suggested by Bonfant), for which there is no authority. l. 2. *Cubiculum.* This term for the grave or tomb, is found, also, in heathen epitaphs. It is applied, by writers on the Catacombs, to a chamber, which "was appropriated as the private vault, so to call it, of a particular family."

34.

AVR · CANDIDIANAE BENE QVESQVEN
TI IN PACE QVAE VIXIT ANNIS XXXI
MENSES · VIIII · CVM MARITO FVIT ANNOS
XI · MENSES · VIII · DIES · X · DEPOSITA KAL [COSS ·
APRIL · CONSTANTINO AVG · II · ET CONSTANTE AVG ·

(*In pavim. æd. S. Apollinaris;* De Rossi, n. 52.)

Aureliæ Candidianæ bene quesquenti (quiescenti) *in pace, quæ vixit annis* (annos) *XXXI, menses IX, cum marito fuit annos XI, menses VIII, dies X. Deposita, Kalendis Aprilibus; Constantino Augusto II et Constante Augusto Consulibus.*

"To Aurelia Candidiana, resting well, in peace, who lived thirty-one years, (and) nine months. She was with her husband (*i.e.* her married life was) eleven years, eight months, (and) ten days. Buried on the Calends of April, in the Consulship of Constantinus Augustus, for the second time, and Constans Augustus," *i.e.* April 1st, 339, A.D.

35.

VISCILIVS NICENI · COSTAE · SVAE
QVAE FVIT · ANNOR · P · M · XXXI · EX QVIBVS
DVRABIT · MECVM ANNOS XV · FECI IN SE
SI EO DONO · SIM · EXIBIT · DE SAECVLO
VI · IDVS · IVL · MAMERTINO · ET · NEVITA

(*In coem. S. Hermetis;* De Rossi, n. 151.)

Viscilius Niceni, costæ suæ, quæ fuit annorum plus minus XXXI, ex quibus durabit (duravit) *mecum annos XV. Feci in se si eo dono sim. Exibit* (exivit) *de sæculo, VI Idus Julias, Mamertino et Nevita* (Nevitta).

"Viscilius, to Nice his rib, who was of thirty-one years (of age) more or less, of which she passed with me fifteen years. I made it for ourselves, if I am (should be) worthy of such a gift. She departed from this world, on the sixth day before the Ides of July, in the Consulship of Mamertinus and Nevitta," *i.e.* July 10th, 362, A.D.

l. 1. *Niceni.* This change of the declension of nouns is common. Thus we have *Leopardeti, Eireneti,* &c. *Ispeti,* for *Spei,* is a notable example of *metaplasmus,* with the introduction of the prefix *i.* See n. 41.

Burgon was not aware of this usage. In p. 197, he gives an inscription—*filiæ Mercuraneti*—and asks: "Who ever heard of such a name as *Mercuranetis?* and yet, since I am sure that the word is copied accurately, what else can the nominative be?" It was *Mercurane,* otherwise *Mercuriane.*

Costæ. There is no authority for the use of *costa* for *uxor,* but there are two examples in Greek, in which Gregory Nazianzen uses the term, doubtless with reference to Genesis, ii., 21.

l. 3. *Feci in se si eo dono sim.* It is very difficult to give a satisfactory interpretation to these words. Lami, to whom we are indebted for the suggestion that *costæ* stands for *uxori,* does not attempt to explain them. Oderic enquires: *an forte* FECI, *hunc nimirum titulum, ne conjux mea* SINE EO DONO SIT, *nempe ne careat hoc amoris mei pignore?* Danzetta proposes: FECI*mus* IN SE*culo* SI*ne* VLLO DOLORE SIM*ul.* De Rossi justly rejects both of these. He explains FECI IN SE, as standing for FECI INTER SE, *i.e. annos XV feci una cum ea,* and explains EO DONO as governed by *dignus* understood; whilst he regards SIM as used for *fuerim,* or *fui, i.e. si tamen eo dono dignus fuerim,* or *fui*—"quo elogio non aliud aptius Christianæ uxori ab viro Christianæ humilitatis studioso potuit inscribi."

This is an ingenious, but unsatisfactory, explanation. I am inclined to take *feci* in the ordinary sense, "made," and *se* as used for "ourselves;" and, adopting De Rossi's suggestion of an ellipsis of *dignus,* to regard *dono* as referring to the "gift," or "blessing," of burial with her; but I am not satisfied.

36.

ERENI QVE VIXITANN
PMXLVCVMCVPARE
SVO FECITANNVSVIII
QVERECESSITIIINONIN
PACESVBDAMASOEPISCO·

(*In Mus. Lat.;* De Rossi, n. 190.)

Ereni (Eirenæ), *que* (quæ) *vixit annos plus minus XLV, cum cupare* (compare) *suo fecit annus* (annos) *VIII, que* (quæ) *recessit III Nonas in pace sub Damaso Episcopo.*

"To Eirene, who lived forty-five years, more or less, passed eight years with her husband, who retired on the third day before the Nones, in peace, under Bishop Damasus," *i.e.* 366 or 367, A.D.

Mamachi, Zaccaria, and Morcelli inferred from this inscription, that the names of the Bishops of Rome were used, from the fourth century, to mark dates. But, in all the dated epitaphs, there is only one other example of this use. See De Rossi, n. 139. The reason for using the terms *sub Damaso Episcopo* here is, that in the first two years of his Episcopate there was a rival bishop, *Ursinus,* or *Ursicinus,* whose claims were supported by a considerable portion of the laity. The deceased, or her friends, took the side of Damasus.

37.

HIC REQUIESCIT IN PACE FILICISSIMA
QVAE VIXIT ANNVS LX·QVAE FECIT CVM VIRO
SUO ANNVS XL·DEPOSITA PRIDIE·KAL·IAN·
HONORIO·AUG·UII·HILARANVS CONTRA
VOTVM POSUIT

(*In Mus. Capitol.;* De Rossi, n. 577.)

Hic requiescit in pace Filicissima (Felicissima), *quæ vixit annus* (annos) *LX, quæ fecit cum viro suo annus* (annos) *XL. Deposita, pridie Kalendas Januarias, Honorio Augusto VII. Hilaranus contra votum posuit.*

"Here rests in peace, Felicissima, who lived sixty years, who passed with her husband forty years. Buried on the day before the Calends of January, in the Consulship of Honorius Augustus, for the seventh time (*i.e.* December 31st, 407, A.D.) Hilaranus placed this against his wish."

This use of *contra votum* is found in heathen inscriptions. The origin of it, I suspect, was, that when a person had made a vow contingent on the recovery of some one from illness, he was disinclined, or was afraid, to omit the performance of the vow, even though the object had not been attained. Here, and in other places, the words simply mean "against the wish." Mark the use of both U and V. l. 2. *LX*. In De Rossi's copy we have XL: I have followed Muratori.

38.

HIC REQVIESCIT IN PACE IANVARIA
L · F · QVAE VIXIT $\overline{\text{PL}}$ · M · ANN · XXVIII · C · MA
RITV · FEC · ANN XV · M · XI · D · X · DEP ·
D · XV · KAL · FEBRVAR · II · $\overline{\text{PC}}$ BILI
SARI $\overline{\text{VI}}$ P IND · PRIMA
HIC REQVIESCIT IN PACE FILICELLVS SVBD ·
QV . . . .

(*Nolæ;* De Rossi, *in comment.* n. 1055.)

Hic requiescit in pace Januaria, laudabilis femina, quæ vixit plus minus annos XXVIII, cum maritu (marito) *fecit annos XV, menses XI, dies X. Deposita, die XV Kalendas Februarias, II post consulatum Bilisari* (Belisarii), *Viri Illustris, per indictione* (indictionem) *prima* (primam). *Hic requiescit in pace Filicellus subdiaconus qui* . . . . . .

"Here rests in peace, Januaria, a praiseworthy woman, who lived twenty-eight years, more or less; passed with her husband fifteen years, eleven months, ten days. Buried on the fifteenth day before the Calends of February, in the second year after the Consulship of Belisarius, during the first Indiction (*i.e.* January 18th, 538, A.D.) Here rests in peace, Filicellus, a Subdeacon, who" . . . . . .

l. 3. *Ann. XV · M · XI · D · X.* From this it appears that Januaria was married when she was about twelve years of age. There are examples of marriage at eleven, and, even, ten. See Fabretti, p. 586, and Orelli, 2653. l. 4. II · $\overline{\text{PC}}$. De Rossi's note, in which he determines the year, is well worthy of attentive perusal.

(*e.*) To a son:—

39.

MIRAE · INNOCENTIAE AC SAPIENTIAE
PVERO · MARCIANO QVI VIXIT ANN · IIII ET
MENSES · IIII · DIES · II · QVIESCET IN PACE
D · PRID · KAL · DEC · ARBETIONE ET LOLLIANO COSS ·
[PARENTES FECERVNT

(*E coem. Priscillæ,;* De Rossi, n. 125.)

Miræ innocentiæ ac sapientiæ puero, Marciano, qui vixit annos IV, et menses IV, dies II. Quiescet (quiescit) *in pace. Depositus, pridie Kalendas Decembres, Arbetione et Lolliano Consulibus. Parentes fecerunt.*

"To Marcianus, a boy of wonderful innocence and intelligence, who lived four years, and four months, (and) two days. He rests in peace. Buried on the day before the Calends of December, in the Consulship of Arbetio and Lollianus (*i.e.* November 30th, 354, A.D.). His parents made this."

40.

CL · MAMERTINO ET FL NEVITTA · CONSS
DVLCISSIMO FILIO PETRIO QVI VIXIT · ANN XII
M · I · D · XV DEP PRID KAL · SEPT · IN PACE
EVTYCHES PATER · FECIT

(*E coem. Callisti;* De Rossi, n. 153.)

Claudio Mamertino et Flavio Nevitta Consulibus, dulcissimo filio Petrio, qui vixit annos XII, mensem I, dies XV. Depositus pridie Kalendas Septembres in pace. Eutyches pater fecit.

"In the Consulship of Claudius Mamertinus and Flavius Nevitta (*i.e.* 362, A.D.), to his very sweet son, Petrius, who lived twelve years, one month, and fifteen days. Buried the day before the Calends of September (*i.e.* August 31st), in peace. Eutyches, his father, made this."

(*f.*) To a daughter:— 41.

TI · CL · MARCIANVS · ET
CORNELIA · HILARITAS
CORNELIAE · PAVLAE · PAR ·
FECR · QVAE · VIX · ANN · X · DIEB
VIII · DEC · X · KAL AVG · MAX · ET
VRB · COS ·

(*E coem. S. Hermetis;* De Rossi, n. 6.)

Tiberius Claudius Marcianus et Cornelia Hilaritas, Corneliæ Paulæ parentes fecerunt, quæ vixit annis (annos) *X, diebus* (dies) *VIII. Decessit, X Kalendas Augustas, Maximo et Urbano Consulibus.*

"Tiberius Claudius Marcianus and Cornelia Hilaritas, (her) parents, made (this) to Cornelia Paula, who lived ten years, eight days. She departed on the tenth day before the Calends of August, in the Consulship of Maximus and Urbanus," (*i.e.* July 23rd, 234, A.D.)

l. 1. The use of the three names—*Tiberius Claudius Marcianus*—deserves special notice. There is no example of this in any Christian epitaph after the third century. This characteristic, and the identity of the names of the deceased with those of the wife of the Emperor Elagabalus, who was contemporary, have suggested the suspicion that the family was of good rank. In Orelli, n. 4570, we have another Cornelia Paula of the date 211, A.D. This inscription is the earliest of those bearing dates that are accompanied by symbols. Those used here are the fish and the anchor. The fish, as is well known, was chosen, as the letters that form the Greek word for it, *scil.* ΙΧΘΥΣ, are the initials of Ἰησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτήρ—Jesus Christ, Son of God, Saviour. Tertullian regarded it as a fit emblem of Him, whose children are "born of water" in baptism. The anchor is regarded as signifying "the close of a well-spent life, the conclusion of a successful voyage, when the anchor is cast;" or that hope, which "we have as an anchor of the soul, both sure and stedfast." Both these symbols are mentioned by Clemens Alexandrinus, as suitable for representation on the seals of Christians.

42.

(See Plate I, 1.)

(*In Secret. S. Mariæ Transtib.;* De Rossi, n. 11.)

Κωσουλε Κλυδειω εδ Πατερνω νωνεις Νοβενβρειβους δειε Βενερες λουνα XXIIII Λευκες φελειε Σεβηρε καρεσσεμε ποσουετε εδ εισπειρειτω σανκτω τουω μορτουα αννουωρωᴍ VL εδ μησωρων XI δευρων X.

Consule Claudio et Paterno, Nonis Novembribus, die Veneris, luna XXIV, Leuces filiæ Severæ carissimæ posuit et spiritui sancto tuo. Mortua annorum LV et mensium XI dierum X.

"In the Consulship of Claudius and Paternus (*i.e.* 269, A.D.), on the Nones of November (*i.e.* November 5th), on Friday, the 24th day of the Moon, Leuce erected (this memorial) to her very dear daughter, and to thy holy spirit. She (died at the age) of fifty-five years, and eleven months, (and) ten days."

(*E coemeterio Saturnini;* De Rossi, n. 11.)

This is the celebrated inscription that Lupi was the first to explain. Marini pointed out that the numerals, which he read ϛL, were written ἀντιστρόφως, *i.e.* = Lϛ = 56. De Rossi shows that those numerals were really VL, which, according to Marini's view, he takes for LV. He corrects the error of Lupi, as to the Consulships being the second of Claudius, and the third of Paternus, and also ascertained that Lupi's suggestion, that the word before αννουωρωᴍ may be *martura,* not *mortua,* must be rejected, as the letters are distinctly MOPTOYA, *i.e. mortua.*

l. 4. Λευκες. In Muratori, p. 27, we have *Lucens* as the Latin form of this name, and in p. ccclxvi, *Leuces.* Orelli, n. 1022, gives *Leuce.* l. 5. *ειςπειρειτω σανκτω τουω, i.e. ispirito* (spiritui) *sancto tuo.* This use of *i* as a prefix is often found in Christian epitaphs. It is one of many indications of the lapse of Latin into Italian. The change of person—*tuo* for *ejus*—occurs in Classical authors. The points in this, as in some heathen inscriptions, are no indication of the intervals between words.

43.

SVCCESSAE FILIAE DVL
CISSIMAE PARENTES · Q · V · AN
NOS DVOS M · XI · D · IIBMINPACE
DPXVIIIKALSEPTNIGRINIANO

(*In Mus. Lat.;* De Rossi, n. 110.)

Successæ, filiæ dulcissimæ, parentes, quæ vixit annos II, menses XI, dies II. Bene merenti in pace. Deposita, XVIII Kalendas Septembres, Nigriniano (consule).

"To Successa, (their) sweetest daughter, her parents (made this); who lived two years, eleven months, two days. To her, well-deserving, in peace. Buried on the eighteenth day before the Calends of September, in the Consulship of Nigrinianus," *i.e.* August 25th, 350, A.D.

44.

REVECCAE INNOCENTI QVAE VIXIT
ANNVM VNVM MENSEM VNVM
DIES XVII BENEMERENTI IN PACE
DEPOSITA VIIII KAL · SEPTEMBRES
FLAVIO · CAESARIO · ET NONIO
ATTICO · VV · CC · CONSS
PARENTES BENEMERENTI FECERVNT

(*In Mus. Capitol.;* De Rossi, n. 450.)

Reveccæ (Rebeccæ) *innocenti, quæ vixit annum, I mensem I, dies XVII. Bene merenti in pace. Deposita IX Kalendas Septembres Flavio Cæsario et Nonio Attico, Viris Clarissimis, Consulibus. Parentes bene merenti fecerunt.*

"To the innocent Rebecca, who lived one year, one month, seventeen days. To her, well-deserving, in peace. Buried on the ninth day before the Calends of September, in the Consulship of Flavius Cæsarius and Nonius Atticus, most distinguished men (*i.e.* August 24th, 397, A.D.) Her parents made this to her well-deserving."

45.

ΤΡΙΑΚΟΝΤΑΠΕΝΤΑΕΤΗϹΕΝΘΑΔΕΚΙΤΕΥΠΑΤΙΑ
ΘΥΓΑΤΗΡΑΝΤΩΝΙΟΥΚΩϹΤΑΝΤΙΝΟΠΟΛΙΤΙϹϹΑ
ΤΗΠΡΟΔΕΚΑΚΑΛΑΝΔΟΝ ΦΕΒΡΑΡΙΩΝΥΠΑΤΙΑΑΝΙΚΙΩ
ΒΑϹϹΟΥΚΑΙΦΙΛΙΠΠΟΥΤΩΝΛΑΜΠΡΟΤΑΤΩΝ

(*In coemet. S. Pauli via Ostiensi;* De Rossi, n. 583.)

Τριακονταπενταετὴς ἐνθάδε κῖτε (κεῖται) Ὑπατία θυγάτηρ Ἀντωνίου Κω(ν)σταντινοπολίτισσα τῇ πρὸ δέκα καλανδῶν Φεβραρίων ὑπατίᾳ Ἀνικίῳ (Ἀνικίου) Βάσσου καὶ Φιλίππου τῶν λαμπροτάτων.

"Here lies Hypatia, thirty-five years of age, daughter of Antonius, a native of Constantinople, on the tenth day before the Calends of February, in the Consulship of Anicius Bassus and Philippus, most distinguished (men)," *i.e.* January 23rd, 408, A.D.

(*g.*) To a brother:— 46.

IOVIANO KARISSIMO
FECIT LAMPADIVS ET SOTERES FRA
TRES PIENTISSIMI MEROBAVDE

(*Pisauri, e coem. Rom.;* De Rossi, n. 330.)

Joviano carissimo fecit (fecerunt) *Lampadius et Soteres fratres pientissimi, Merobaude.*

"To dearest Jovianus, Lampadius and Soteres, his most affectionate brothers, have made (this), in the Consulship of Merobaudes [and Saturninus]," *i.e.* 383, A.D.

The lower portion of the stone has been broken off; it most probably had the letters ET SATVRNINO CONSS.

(*h.*) To a sister:— 47.

SVME SOROR CARMEN SOLA*tia*
TRISTA FRATRIS · QVI *sol*
VS GEMITV HEC TIBI VE*rba*
DEDIT · QVAE TEGITVR T*umu*
LO SI VIS COGNOSCERE *lect*
OR · SVBLIMES GESS*it*
SANGVINIS HAEC TIT*ulos*
MORIBVS · HEC CRI*stum*

SEMPER COMITAT*a*
SVPERSTES · QVEM *post*
FATA SIBI CREDID*it*
ESSE DVCEM ·
DEPOSITA IN PACE
$\overline{\text{CON}}$ FESTI ET M*arciani*

(*In atrio coemet. S. Laurentii in agro Verano;* De Rossi, n. 841.)

Sume soror carmen solatia trista (tristia) *fratris,*
Qui solus gemitu hec (hæc) *tibi verba dedit.*
Quæ tegitur tumulo si vis cognoscere, lector,
Sublimes gessit sanguinis hæc titulos.
Moribus hec (hæc) *Cristum* (Christum) *semper comitata su-*
Quem post fata sibi credidit esse ducem. [*perstes,*
Deposita in pace Consulatu Festi et Marciani.

"Sister, take these verses, the sad comfort of your brother, who, in lonely lamentation, has given these words to you. Reader, if you desire to know who is covered by this tomb, she bore names that told her high descent. She, when alive, always followed, in her conduct, Christ, who, she believed, would be her guide after death. Buried in peace, in the Consulship of Festus and Marcianus," *i.e.* 472, A.D.

v. 4. I have interpreted this verse as referring to such names as *Eugenia.* It is scarcely possible that it can mean *martyrdom.* There is no dated epitaph in which the deceased is called *Martyr*, or is said to have suffered such a death: and in those not dated, examples are extremely rare.

(*i.*) To a Foster-father:— 48.

PERPETVAM · SEDEM NVTRITOR POSSIDES IPSE
HIC MERITVS FINEM MAGNIS DEFVNCTE PERICLIS
HIC REQVIEM FELIX SVMIS COGENTIBVS ANNIS
HIC POSITVS PAPASANTIMIO QVI VIXIT ANNIS LXX
DEPOSITVSDOMINONOSTROARCADIOIIETFLRVFINO
VVCCSS NONAS NOBEMB

(*E vinea, via Salaria nova;* De Rossi, n. 403.)

Perpetuam sedem, nutritor, possides ipse:
Hic meritus finem magnis defuncte periclis:
Hic requiem felix sumis cogentibus annis:
Hic positus papas Antimio qui vixit annis

septuaginta. Depositus Domino Nostro Arcadio II et Flavio Rufino, Viris Clarissimis, Nonas (Nonis) *Nobembres* (Novembribus).

"You yourself, who reared (us or me), now occupy a lasting resting-place; here you have reached the end that you deserved, of a course fraught with great perils: here, in happiness, you take the repose that age compels. Here is laid Foster-father Antimio, who lived seventy years. Buried in the Consulship of our Lord Arcadius, for the second time, and Flavius Rufinus, most distinguished men, on the Nones of November," *i.e.* November 5th, 392, A.D.

The history of this epitaph is very curious and instructive. De Rossi's comment on it, in which he gives an account of the controversy that it excited, is well worth reading. It is a good specimen of the slashing style of annotation, with which Bentley has made English scholars familiar.

The stone bearing the inscription was found near Rome, in the year 1787. Antonio Paoli first published it, with an engraving and a long dissertation, *Di S. Felice papa e martire*, in which he attempted *defendere la sua santità, ed il suo pontificato*, referring FELIX, in the third verse of the epitaph, to the Pope, known as "Felix the Second." Such an attempt, of course, drew down on him the censure of men of superior learning, who knew, from unquestionable historical authority, that Felix the Second was not buried even near the place where the stone was found, and, besides, that his death occurred not in A.D. 392, the date on this stone, but in A.D. 365. *Marini published a short treatise on the subject, in which he completely refuted Paoli, and showed that the epitaph was neither of Felix the Second, nor of any other Pope, but of a foster-father *(papas)*, whose name was *Antimio*, *i.e.* PAPAS ANTIMIO. Paoli, however, was not convinced of his error, but attempted to vindicate his views in '*Lettera in difesa dell' epitaffio di S. Felice II.* Oderic and Tiraboschi then assailed him, sustaining Marini's interpretation, and Juvenati satirized him in severe hendecasyllabics. Even then Paoli clung to his mistake, and published another letter in his defence, so absurdly erroneous, that De Rossi designates it as *stuporis plenam, quam eruditorum nemo vel uno verbo refutare dignatus est.*

The controversy relative to the interpretation of the epitaph here died out, but, since then, it has been revived by Dr. Maitland and by [*]Bishop Kip. Neither of these writers seems to have been aware of the discussion which had taken place. Maitland's observations on it are:—"The date of this Consulate is 392, in which year no bishop of Rome died. Siricius was made pope in 385, and lived to 396; yet the reference to a perpetual [†]*seat*, added to the title *papa sanctissimus*, strongly indicates episcopal rank. This *Papa* may have been an anti-pope, there being a schism at that time in Rome." De Rossi derides his ignorance *totius controversiæ vel lippis ac tonsoribus notæ*, and ridicules his object in citing the epitaph. There is no doubt that Maitland was unacquainted with the literary history of the inscription, and that he misread and misinterpreted the words *papas Antimio*. But De Rossi's censures are too strong, and he seems to have misunderstood Maitland's object. Maitland was not the only one, besides Paoli, who was mistaken relative to this inscription. Fea—*haud sordidus auctor*—held the same opinion, that it was the epitaph of some bishop; and Maitland was evidently not ignorant of the fact, that *papa* was the common appellation of all bishops, whether in or out of the City, for he distinctly states this, and gives in illustration the application of the term to the Bishops of Carthage and Hippo.

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* This learned Epigraphist arranged the inscriptions in the *Galleria delle Lapidi* in the Vatican.

The author of these verses was a reader of Virgil, but does not seem to have profited by the perusal. The first line was, probably, suggested by the opening of the seventh book of the Æneid, in which the grave of Caieta—*Æneia nutrix*—is mentioned. The words *magnis defuncte periclis* are taken from *Æn.*, vi., 83. See, also, ix., 98. The verses, that are found in ancient epitaphs, present many examples of violation of the ordinary rules of syntax and prosody. "In [Greece] and Italy, as in England, the Muse of the cemetery was an 'unlettered Muse.'" See Kenrick, "Roman Sepulchral Inscriptions," p. 21.

Northcote, "The Roman Catacombs," p. 136, observes:—"It is a very singular fact, that there are actually more instances of *alumni* among the sepulchral inscriptions of Christians, than among the infinitely more numerous sepulchral inscriptions of Pagans; showing clearly that this was an act of charity to which the early Christians were much addicted, and the *alumni*, when their foster-parents died, very properly and naturally recorded upon their tombs this act of charity, to which they were themselves so deeply indebted." I have not compared, by counting, the number of instances of such inscriptions, but I have reason to think, that the opposite opinion is true. Of all the dated Christian epitaphs of Rome, in number between 1300 and 1400, I have not noticed one of an *alumnus*, and this is the only example of a memorial to a foster-father.

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[*] His remarks are merely a reproduction of Maitland's.

[†] Maitland's reference here, seems to be to the use of *sedere* in the sense "to hold a bishopric," and we find such expressions as *sedit annos decem* denoting the time during which a person occupied the office of Bishop. This use of *sedere* is, however, not peculiar to *Episcopi*. In De Rossi, n. 879, an epitaph of a Presbyter, we find the words QVI SEDIT PBB.

(*To be continued.*)

SIR WILLIAM HAMILTON'S PHILOSOPHY: AN EXPOSITION AND CRITICISM.

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II.—*Exposition of Hamilton's System.*

It is unnecessary to remind those who are acquainted with the writings of Sir William Hamilton, that none of these contains the complete exposition of a system, that they are all fragmentary contributions to isolated departments of philosophy, or fragmentary discussions of isolated philosophical problems. It is therefore but just to mention that the following exposition is, so far as I am aware, the first attempt to cast his separate opinions into systematic connection. I have throughout adhered as strictly as possible to his own terminology and phraseology, and I have given no statement as his which is not authorized by a reference to some passage in his writings. As the *Lectures on Metaphysics* supply most of the passages referred to, I have, for brevity's sake, omitted the title of the Lectures; and, therefore, when the contrary is not expressed, it is to be understood that the figures within parentheses indicate the volume and page of that work, in which the authorities are to be found.

I have only to say further that, in order to aid the exposition, I have throughout spoken in the person of Sir William, and that, therefore, from this point "I" refers not to the philosopher's exponent, but to the philosopher himself.

INTRODUCTION.

§ 1.—*Definition of Philosophy.*

It is perhaps impossible adequately to comprehend philosophy in a single definition; for from different points of view it may be regarded as either *theoretical,* i. e., in relation to man as an intelligence, or *practical,* i.e., in relation to man as a moral agent, either *objectively,* i. e., as a complement of truths, or *subjectively,* i. e., as a habit of the mind. I shall therefore content myself with attempting to make as precisely intelligible as the unprecise nature of the object matter permits, what philosophy is and what are the sciences properly comprehended within its sphere (I. pp. 49–51).

Philosophy then is a kind of knowledge, and of knowledge there are two kinds:

I. That which we obtain either (1) through sense, of what exists and occurs in the material world, or (2) through self-consciousness, of what exists and occurs in the world of thought. This is a knowledge merely *that* things are, and may therefore be called *historical* or *empirical* (I. pp. 53–6).

II. But we never know, and cannot even conceive, things out of connection with one another; we cannot realize the possibility of a phenomenon which is not the effect of some cause. Still the knowledge of the cause is not given in the knowledge of the effect; and therefore the necessity to think of every phenomenon, that it must have some cause, compels us to search what that cause is. When we have found its cause, we know *why* or *how* a thing is; and this knowledge is *philosophical* or *scientific* or *rational* (I. pp. 56–8).

Such is philosophical knowledge in its most extensive signification; and in this signification all the sciences, inasmuch as they are occupied in the investigation of causes, may be viewed as so many branches of philosophy (I. p. 61).

There is, however, one section of the sciences, to which by pre-eminence the name of philosophy is applied, and on these grounds:

I. Since philosophy is a knowledge, its primary problem must be to investigate and determine the conditions under which knowledge is realized, as these must form the conditions of philosophy itself.

II. As philosophy is a knowledge of causes, and as the mind is the principal concurrent cause in every act of knowledge, philosophy is bound to make the mind its first and paramount object of consideration (I. pp. 61–2).

Philosophy is, therefore, in its stricter meaning, confined to the sciences which constitute, or hold immediately of, the science of mind (I. p. 64).

§ 2.—*Division of Philosophy.*

As such, philosophy is threefold, for it is an answer to three questions.

I. What are the facts or phenomena to be observed? The department of philosophy, which answers this question, is commonly called *Psychology*, *Empirical Psychology*, or the *Inductive Philosophy of Mind.* We might call it *Phenomenal Psychology.*

II. What are the laws which regulate these facts, or under which these phenomena appear? The department which answers this question may be called the *Nomology of Mind* or *Nomological Psychology.*

III. What are the real results, not immediately manifested, which these facts or phenomena warrant us in drawing? The philosophical science which answers this, is usually called *Ontology*, or *Metaphysics proper.* It might be named *Inferential Psychology.*

Of these divisions of philosophy, the last two must evidently be founded on the first. With the first, therefore, it is necessary to begin (I. pp. 121–5).

FIRST DIVISION OF PHILOSOPHY.—PHENOMENAL PSYCHOLOGY.

Phenomenal Psychology is the science conversant about the phenomena or modifications or states of the mind (I. p. 129).

INTRODUCTION TO PHENOMENAL PSYCHOLOGY.—CONSCIOUSNESS.

§ 1. *General Nature of Consciousness.*

In order to discover the phenomena of the mind, it is necessary to know the characteristic by which they are distinguished from all others. This is *consciousness,* i.e., the knowledge that I, that the Ego exists in some determinate state. In this knowledge alone they are realized, and with this knowledge they disappear (I. pp. 182–3). The phenomena of the mind are thus merely special forms of the generic phenomenon, consciousness; and accordingly consciousness becomes naturally the first object of consideration (I. p. 189).

Though we may be fully aware of what it is, consciousness cannot be defined; for it is itself the highest source of all comprehensibility and illustration. The notion of consciousness cannot therefore be resolved into any more simple, or brought under one more general. But consciousness may be analysed, and it is thus found, in its simplicity, to involve three things:—1, A recognising or knowing subject; 2, A recognised or known modification; 3, A recognition or knowledge by the subject of the modification (I. pp. 192–3). We may therefore lay it down as the most general characteristic of consciousness, that it is the recognition by the thinking subject of its own acts and affections (I. p. 201).

§ 2. *Special Conditions of Consciousness.*

So far, philosophers are agreed; but it is more difficult to determine the special characteristics of consciousness. I shall therefore state:—

I. Those which are too palpable to be called in question. These are, that consciousness—

1. Is an actual, not a potential, knowledge;
2. Is an immediate, not a mediate, knowledge;
3. Implies a discrimination (*a*) of self from not-self, (*b*) of the different states of self, (*c*) of the different parts and qualities of not-self;
4. Implies judgment, inasmuch as (*a*) discrimination is merely the denying one thing of another, and (*b*) the consciousness of any object involves an affirmation of its external, or internal, existence;
5. Implies memory, inasmuch as, (*a*) without it the mental states could not be retained in order to their discrimination, and (*b*) the notion of self arises from the recognised permanence and identity of the subject in contrast to the recognised succession and variety of its modifications (I. pp. 201–5).

II. It is not, however, so generally admitted that consciousness is not a special faculty coördinate with the other special faculties of knowledge, but the generic faculty which is coëxtensive with them all (I. p. 207).* On the contrary, it is maintained by Reid, Stewart, Roger Collard, and others—1, That consciousness is merely a special faculty of knowledge; and consequently, 2, that its special object is the operations of the other faculties to the exclusion of the objects about which these operations are conversant. But neither of these positions is tenable, for—

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* This is described by Hamilton as only "the *first* contested position," which he intends to maintain, with regard to consciousness (I. p. 206); but it leads him into a long digression (I. pp. 206–263), at the close of which there is no mention of any other contested positions. Did this digression cause him to forget his apparent intention to continue the subject from which he started? His editors give no indication that they have observed this seeming omission.—J. C. M.

1. Though I may feel without knowing, though I may perceive without imagining, and imagine without perceiving; though I may in general perform an operation of one of the special faculties without requiring to perform an operation of any other, I can perform an operation of none without being conscious of it. Consciousness cannot therefore be distinguished from the special faculties in the same way in which they are distinguished from one another; it is the necessary condition of them all.

2. Knowledge is a relation between an operation and its object. The object, in fact, determines the distinctive character of the act; and we could not be conscious of any one act as distinguished from others, were we unconscious of the object by which it is determined (I. pp. 207–231; *Discussions*, pp. 47–52).

§ 3. *Evidence and Authority of Consciousness.*

Consciousness is therefore the condition of all the mental phenomena; and accordingly it is mainly, if not solely, to consciousness, that we must resort for an acquaintance with these phenomena (I. p. 264.) According to the doctrine of phrenology indeed, an acquaintance with the various mental powers may be obtained by observation of the various parts of the brain, which that science maintains that it has discovered to be their several organs. But though the mind, in its lower energies and affections, is immediately dependent on the conditions of the nervous system, and, in general, the development of the brain in different species of animals is correspondent to their intelligence, still it is impossible to connect the mind or its faculties with particular parts of the nervous system (I. p. 404). For I have proved, by the most extensive induction, that the alleged physiological facts, on which phrenology professes to be based, such as its assertion of the correspondence between the development of the cerebellum and the function which it ascribes to it, are often not only unfounded, but the very reverse of the truth (I. pp. 409 *et seq.; Discussions*, p. 647).

It is therefore by the investigation of consciousness that we are to discover the phenomena of the mind; and accordingly if our information regarding these phenomena is to be accepted as reliable, the deliverances of consciousness must be presumed to be trustworthy. Now as there is no authority beyond consciousness by which its trustworthiness can be tested, no reason can be adduced, unless it be in the deliverances themselves of consciousness, to prove that they are untruthful, and consequently it would imply an utterly groundless presupposition to start with the assumption, that they are false, that we have been made so as inevitably to accept an illusion for a reality, that the Maker of us is a deceiver. The deliverances of consciousness therefore must be presumed true till they have been shown to be false; and false they can be shown to be only when they have been proved to be contradictory (I. pp. 399–400; *Discussions*, pp. 86–87; *Reid's Works*, pp. 745–7).

Does it not then seem that the deliverances of consciousness must be contradictory, since the most contradictory systems of philosophy equally profess to be founded upon them? By no means; for the antagonism of philosophical systems arises not from the falsity or vacillation of consciousness, but from philosophers resorting to it to obtain confirmation of their preconceived opinions rather than to form opinions yet unconceived, just as the variety of theological systems has been occasioned by theologians resorting to the Bible to discover not what they shall believe, but what they believe already (I. 266–7; *Reid's Works*, pp. 746–7). Since therefore the errors of philosophers have arisen from the want of any recognised principle in investigating consciousness, we must assume the hitherto unattempted task of discovering the rules by which we ought to be guided in such investigation. These are the three following:

1. That we admit nothing which is not either an original datum of consciousness or the legitimate consequence of such a datum;
2. That we embrace all the original data of consciousness and all their legitimate consequences;
3. That we exhibit each of these in its individual integrity, neither distorted nor mutilated, and in its relative place, whether of preeminence or subordination.

These maxims I would name severally the Laws of Parcimony, Integrity, and Harmony (I. pp. 267–9; *Reid's Works*, p. 747).

§ 4.—*Classification of the Phenomena of Consciousness.*

Proceeding then to investigate the phenomena of consciousness in accordance with these laws, we find that they are all capable of being analysed into three classes: 1. The phenomena of Knowledge or Cognition; 2. the Feelings or the phenomena of pleasure and pain;

3. the Conations or the phenomena of desire and will (I. pp. 183-4). This classification indeed has met with objections.

I. It has been argued that, as every mental phenomenon is possible only through consciousness and consciousness is an act of knowledge, knowledge must be the fundamental power of the mind, from which the others are derivative ; and that consequently the other two classes are notcoordinate with knowledge. But this objection overlooks the fact that, though feelings and conations exist only in so far as they are known, yet they contain an element which was never involved in, and could therefore never have been evolved out of, mere knowledge (I., pp. 187-8).

II. By others it is maintained that all mental action is either in an inward, or in an outward direction, the former being immanent and cognitive, the latter transeunt and conative. Hence it is argued that, if we interpolate a third species of activity, its direction must be either immanent or transeunt, or both, or neither of these; but on the first three suppositions there are still only two kinds of mental activity, and on the fourth there is merely an additional activity in no direction, which is no activity at all. In answer to this it may be said, 1. that, in place of two forms of mental activity, we may competently suppose three, ineunt, immanent, and transeunt; 2. that directions are properly ascribed only to the movements of external things (II. pp. 421–5.)

Though these three classes of mental phenomena are thus distinguishable, they never actually exist apart; every moment of our mental life is made up of some form of all the three (I. pp. 188–9.) Of the three, however, knowledge is first in order; for on the one hand a being may be conceived capable of knowledge, yet devoid of feeling as well as of will or desire, while on the other hand we cannot conceive a being possessed of feeling or desire without the knowledge of any object on which his affections may be employed and without a consciousness of these affections (I. pp. 188–9; II. pp. 425–8).

The phenomena of knowledge come therefore first under consideration, and philosophy is principally and primarily the *Science of Knowledge (Reid's Works*, p. 808, note).

FIRST PART OF PHENOMENAL PSYCHOLOGY.—PHENOMENOLOGY OF THE COGNITIONS.

The phenomena of knowledge cannot but be conceived as effects, as the manifestations of a power of knowledge possessed by the mind; and therefore the different kinds of knowledge may be viewed as the manifestations of so many powers or faculties of knowledge. The faculties, into which the general cognitive faculty of the mind may thus be divided, appear to me to be six.

First Faculty.—The Presentative.

As we possess knowledge and have not possessed it always, we must have a faculty by which it has been at first acquired or presented to the mind. Such a faculty may therefore be called the *Acquisitive* or *Presentative*, and when directed to the nonego, is External Perception, when directed to the ego, Self-consciousness.

§1. *External Perception.*

External or *Sensitive Perception*, or *Perception* simply, when used in a less restricted sense, is the consciousness, in one's own body, either (1) of those *special* affections of which, as an *animated* organism, it is succeptible, or (2) of those *general* relations of extension, which, as a *material* organism, it possesses in common with all material things. Only the latter consciousness is *Perception proper;* the former is *Sensation proper* (*Reid's Works*, p. 876). This distinction it is necessary to explain, as well as a correlative distinction in the qualities of matter.

A. The distinction between perception and sensation, noticed long ago, has never been adequately understood, from never having been viewed as merely a special instance of a more general contrast between the phenomena of knowledge and the phenomena of feeling, but especially from the law, which governs their reciprocal relation, never having been enounced. The law is that, above a certain limit, knowledge and feeling, and therefore perception and sensation, though always coëxistent, are always in the inverse ratio of each other (II. pp. 93–99) This law is proved,

I. By comparing the several senses. For, in sight and hearing, especially in the former, as distinguished from taste and smell, the knowledge communicated evidently predominates over mere feeling, while in the two latter senses the pleasures and pains absorb the consciousness so entirely, that the information we receive from them is reduced to a minimum.

II. By comparing the several impressions of the same sense. The difference between these may be either in *degree* or in *kind*. 1. A certain *degree* of sensation is of course necessary to perception, and therefore it is not without any reserve true that the minimum of sensation implies the maximum of perception; but beyond a certain limit, the amount of information conveyed by an impression on any sense is in the inverse proportion of its intensity. 2. Different *kinds* of impressions on a sense are also subject to the same law; figure, for example, affords to the eye less organic pleasure and pain than color, but more knowledge, while color furnishes less knowledge, but more pleasure and pain (II. 99–104).

In sensation proper, therefore, the organism may be considered as of the ego, as subjective; in perception proper as of the nonego, as objective (*Reid's Works*, pp. 881–858, note). Accordingly, in mere sensation, I am conscious of my organism, not as a material object possessing the general properties of all matter, but only as the subject ofa particular affection. Such sensation however affords the requisite condition of perception. For I cannot be conscious of any particular affection of my organism, except as distinguishable from others; and I thus become conscious of sensible affections of my organism as distinct, that is, as *out of* one another. But the perception of such reciprocal outness of two or more sensations is the perception of extension. Accordingly any two sensations, felt as distinct, may thus occasion the perception of my own organism as extended (*Reid's Works*, pp. 861, note, and 882); but of bodies beyond my organism a perception is possible only in the consciousness of resistance to my locomotive energy (Ibid, p. 882).

B. Corresponding to this subjective distinction, an objective distinction may be drawn between the qualities of matter; for some of these are objects of perception, others are merely the unperceived causes of sensation, while a third class are, in one phase, objects of perception, in another, the unperceived causes of sensation.

I. The first are the *primary qualities*, that is, those which are involved in, and may be evolved from, the essential conception of matter as *a substance occupying space*. This conception is two-fold, for in accordance with it, matter may be conceived either (1) as *filling space*, or (2) as *being contained in space*.

1. The attribute of filling space, or *solidity simple*, implies two properties:

(*a*.) Trinal extension, in length, breadth and thickness, or *solidity geometrical;* and this again implies α. Divisibility or Number, β. Magnitude, γ. Figure:

(*b*.) The incapability of being compressed into an unextended substance, or *Solidity physical.* This may be called *Ultimate* or *Absolute Incompressibility.*

2. The attribute of being contained in space implies

(*a.*) *Mobility* or the possibility of motion and consequently of rest,

(*b.*) *Situation* or *position.*

II. The qualities of matter, which are partly objects of perception and partly causes of sensation, may be named *Secundo-Primary.* They suppose the primary, because they have a relation to motion in space, being all only various forms of resistance to our locomotive energy; but on the other side they are modes of pressure affecting our sentient organism. They may be divided either from a *physical* or from a *psychological* point of view.

1. *Physically* their divisions correspond to the different external sources of resistance, which are three.

(*a.*) *Coättraction* is either α. that of *Gravity,* originating the relative qualities of *heavy* and *light,* or β. that of *Cohesion,* originating the relative qualities of *hard* and *soft, solid* and *fluid, viscid* and *friable, retractile* (elastic) and *irretractile* (inelastic) &c.

(*b.*) *Repulsion* gives rise to the counter qualities of α. the *relatively compressible* and *incompressible,* β. the *resilient* (elastic) and *irresilient* (inelastic).

(*c.*) *Inertia,* combined with Magnitude and Cohesion, comprises the counter qualities of the *relatively moveable* and *immoveable.*

2. *Psychologically* they are divisible in accordance (*a.*) with the *degrees* of resistance offered, (*b.*) with the mode in which the resistance may affect the sentient organism. The former is their objective or quasi-primary aspect, the latter their subjective or secondary; but I do not carry this distribution into detail.

III. The remaining class, which are called the *Secondary Qualities* of matter, are, in so far as they belong to bodies, merely the powers, which these are supposed to possess, of producing affections in our sentient organism. I use the expression *Secondary qualities,* however, for these subjective affections themselves; and in this sense their varieties depend principally on the differences of the different parts of our nervous apparatus (*Reid's Works,* Note D.)

With regard to perception in general then it will be observed, that in every act of perception I am conscious at once of myself as perceiving and of something which is not myself as perceived (I. p. 288; *Reid's Works,* p. 747, and *passim*). That this is the fact of which we are conscious, is admitted even by those philosophers who refuse to recognise the fact in their systems (I. pp. 289—292; *Reid's Works*, pp. 747—8); still the testimony of consciousness in this instance has been rejected, and every alternative, which could possibly be suggested to explain perception without admitting it to be an immediate knowledge of a nonego, has been actually maintained by one philosopher or another (I., pp. 285—299; *Reid's Works*, pp. 816—9). The grounds, however, on which the testimony of consciousness is in this case rejected, are wholly incompetent, as indeed such rejection in any case must be suicidal to the philosophical system which is guilty of it (I. pp. 116—133); and we are consequently forced to admit as an ultimate and therefore inexplicable fact, that the knowledge of the external world is equally immediate with that of the internal.

§ 2. *Self-consciousness.*

With regard to this form of the Presentative Faculty all the most important questions have already been discussed in connection with consciousness in general (II., pp. 185—204).

Second Faculty—The Conservative.

As the knowledge we acquire is not immediately lost, we must possess a faculty, or rather a capacity, by which it is retained or conserved; and it is this power which, in ordinary language, is most prominently expressed by the word *Memory*. The fact of retention various attempts have been made to account for by physiological and other hypotheses; but it is most easily explained by the self-activity of the mind. For knowledge is acquired not by mere passive impressions on the mind, but by the mind spontaneously exerting its own power. Every act of knowledge is therefore an energy of the self-active power of a subject one and indivisible; and consequently a part of the ego would require to be detached or annihilated, if a cognition once existent were again extinguished. Hence the most difficult problem is not how a mental activity endures, but how it ever vanishes. This problem is solved by the consideration that, though a mental activity ceases to affect our consciousness, it does not on that account cease to exist. The mind possesses a certain amount of force which must be distributed in various degrees among its various activities. Of these the newer and fresher must necessarily be more vivid than the older; and consequently as the former crowd in upon the latter, these must fade into various degrees of obscurity just as, when our attention is concentrated on one object, it is unavoidably withdrawn from others. No mental activity therefore, which has once been excited, is ever wholly lost, though the great proportion of our mental possessions exist beyond the sphere of consciousness (II. pp. 209--218).

The existence of latent states of mind, while it explains the phenomena of memory, is also proved on independent grounds. For

1. In external perception there is required in the object a certain amount of force, less than which is incapable of affecting the senses. This *minimum sensibile*, however, is composed of parts which separately are incapable of awakening sensation. Every sensation, therefore, of which we are conscious, results from a combination of impressions of which we are unconscious.

2. It frequently happens that one state of consciousness follows immediately upon another, although their connection cannot be accounted for by any of the laws of association. This can be explained solely by the supposition that both states of consciousness have been connected with a state of mind which has acted as the intermediate link between them without rising into consciousness.

3. In the exercise of our acquired dexterities and habits we are conscious of performing a whole series of actions without being conscious of the individual steps of the series. This in like manner can be explained only by supposing that the separate volitions, which produce the different actions of the series, all actually take place, though with such rapidity that they are unable separately to affect the consciousness (I. pp. 349–61).

Third Faculty—The Reproductive.

As we not only retain our knowledge out of consciousness, but can bring it back into consciousness again, we must possess a faculty by which it is reproduced. This reproduction may take place with or without an act of will; and in the former case it is called *Reminiscence*, in the latter *Suggestion* (II. pp. 246–7).

But whether voluntary or involuntary, the resuscitation of past mental states is alike subject to law. The laws, in accordance with which one mental state is determined to succeed another, have all their ground in three subjective unities or wholes :

(1). The unity of thoughts, differing in *time* and *modification* in a co-identity of subject; (2). The unity of thoughts, differing in *time*, in a co-identity of *modification;* (3). The unity of thoughts, differing in *modification*, in a co-identity of *time* (*Reid's Works*, p. 912).

I. Of these the first affords a common principle of the possibility of mutual suggestion for all our mental movements, however different in character, however remote in the times of their occurrence. It may be called the *Law of Associability or Possible Co-Suggestion*, and stated as follows: *All thoughts of the same mental subject are associable or capable of suggesting each other.*

II. The second unity affords the first law of *actual* reproduction, which may be named the law of *Repetition* or *Direct Remembrance*, and stated as follows: *Thoughts co-identical in modification, but differing in time, tend to suggest each other.*

III. From the third unity arises the second law of actual reproduction, which I call the *Law of Redintegration, Indirect Remembrance* or *Reminiscence*, and which may be stated as follows: *Thoughts, once co-identical in time, are, however different as mental modes, again suggestive of each other, and that in the mutual order which they originally held* (*Reid's Works*, pp. 912–3).

Under these two *general* laws, by which the reproduction of mental states is actually determined, may be easily included, as *special* instances, the laws (1) of *Similars*, comprehending the laws of *Analogy* and *Affinity*, (2) of *Contrast*, (3) of *Co-adjacency*, comprehending Cause and Effect, Whole and Parts, Substance and Attributes, Sign and Signified (*Ibid*, pp. 913–6).

Moreover these two general laws are to be regarded as *abstract* or *primary* principles which are frequently crossed and superseded by a *secondary* or *concrete* principle. This principle, though scarcely deserving the name of a law, may be styled the *Law of Preference* and stated in the following form: *Thoughts are suggested, not merely by force of the general subjective relation subsisting between themselves; they are also suggested in proportion to the relation of interest (from whatever source) in which these stand to the individual mind.*

Fourth Faculty—The Representative.

But the knowledge thus recalled can be held up before the mind, and this act implies further a faculty of *Representation*, the *Imagination* of ordinary language (II., pp. 259—276).

Fifth Faculty—The Elaborative.

These four faculties however merely furnish the materials on which the mind operates by a higher faculty, of which the rudimentary function is comparison, and of which also conception, judgment, reasoning, abstraction, generalisation are only different acts.

Sixth Faculty—The Regulative.

The acts and processes, by which the mind acquires, retains, reproduces, represents and compares objects, are performed not at random, but in accordance with certain laws; and as these laws are presupposed in order to the possibility of mental action, they cannot be explained as the growth of such action, but must be viewed as native to the mind. The existence of such principles has been recognised by the most distinguished philosophers from the dawn of speculation to the present day (*Reid's Works,* pp. 770—803), even by some of those who profess to derive all our knowledge from experience (Ibid., pp. 743, 785). Now the power, which the mind possesses, of regulating its own activity by such laws, is that which I call the Regulative faculty and which is variously designated Νοῦς, *Intellectus, Reason, Common Sense,* &c., (II., pp. 347—350; *Reid's Works,* pp. 755—770). The native cognitions of this faculty are distinguished from derivative cognitions by the four essential characters, that they are 1. *incomprehensible,* 2. *simple,* 3. *necessary* and therefore *absolutely universal,* 4. *evident* and *certain.* Their most distinctive characteristic however is the third, inasmuch as they reveal themselves as principles by which the mind cannot choose but be controlled (*Reid's Works,* pp. 754—5; I., pp. 269—270; II., pp. 350—363).

In clasifying these necessary judgments we may, with Kant, separate those that are *analytic* or *explicative* from those that are *synthetic* or *ampliative* (II., p. 526; *Discussions,* Appendix I. (A).).

A. The former result from the requirements of the three *logical* laws of Identity, Non-Contradiction and Excluded Middle. They do not amplify our knowledge, enouncing merely what is not-impossible: but they are not only necessary in thought; they are the irresistible assertions of a necessity in things.

B. The latter result from the law of the *relativity of all human knowledge,* with special reference to which, rather than to the condition of Non-Contradiction, I use the expression, the *Law of the Conditioned* (*Discussions,* p. 603). This condition, which requires that all that is thought be thought as relative and even as relatively or conditionally relative, is a law not of things, but merely of thought. For under it are found several pairs of contradictory propositions, while of the two contradictories composing each pair neither can be conceived possible, though, by the Law of Excluded Middle, one must be true. We thus obtain a distinctive test of those necessities of thought which arise from the Law of the Conditioned; and these are thus shown to be merely the irresistible recoil of the mind from either of two unthinkable contradictories. When from my inability to think a certain proposition I am driven back without choice upon its contradictory and find that there is no counter inability to think this, then the necessity to think it is *positive* and arises from a *power* of the mind. For example, I am unable to think that $2+2$ is not equal to 4, and I am consequently forced to the contradictory judgment that $2+2=4$. Now there is no repulse from this latter contradictory as inconceivable, similar to the repulse from the former. But in the case of the necessities now to be considered, when our inability to conceive one of two contradictories forces us back on the other, this we find ourselves equally unable to conceive with that. We must therefore regard the necessity which repels us from either contradictory as *negative*, as originating from an *impotence* of the mind; and the Law of the Conditioned should not be viewed as valid beyond our own thought, of whose limitation it is the expression (II., pp. 366—9).

It would be manifestly out of place to attempt the classification of those contingent and derivative relations, which we frequently employ in the exercise of our cognitive faculties; and therefore we limit ourselves to those relations which are necessary and original. These arise either (I.) from the *subject* and form the *relation of Knowledge*, or (II.) from the *object* and form the *relations of Existence.*

I. The former is the relation between subject and object, which requires that everything must be thought as belonging wholly to either or partly to both of these correlatives.

II. The latter are either (1) *intrinsic* or (2) *extrinsic.*

1. The *intrinsic*, which may also be called the *qualitative*, relation is that of *substance and quality*. For while qualities can be conceived as existing not in themselves, but only in a substance, substance itself can be conceived only as the inconceivable correlate of qualities; so that, in different aspects, every substance is a quality, and every quality a substance (I., pp. 137—8, and 149; *Discussions*, p. 605).

2. The *extrinsic* may also be called *quantitative* and are three in number, as constituted by three species of quantity.

i. *Protensive quantity*, *Protension* or *Time* may be considered *firstly* in itself: and as such it is (*a*) positively inconceivable either α as absolute, *i.e.*, as absolutely beginning or ending, or β as infinite, *i.e.*, as unbeginning or unending, and also either α as an absolutely indivisible minimum or β as infinitely divisible; but it is (*b*) positively conceivable as relative, *i.e.*, as an indefinite past, present or future, and also as an indefinite mean between an absolute minimum and an infinite divisibility. *Secondly,* Time may be considered in relation to the things it contains: and these are either (*a*) coinclusive, when α if contemporaneous, they are identical apparently and in thought, β, if of different times, they appear different, but are thought identical; or (*b*) coexclusive, when they are mutually either prior, posterior, or contemporaneous. The impossibility of thinking as non-existent what has once been thought as existent in time affords the mental principle of causality.

ii. *Extensive quantity, Extension or Space* may likewise be considered *firstly* in itself: and as such it is (*a*) positively inconceivable α, as infinitely unbounded or absolutely bounded, β as infinitely divisible or absolutely indivisible; but it is (*b*) positively conceivable either as an indefinite whole or as an indefinite part. *Secondly,* it may be considered in the things which it contains: and these may be viewed (*a*) in relation to space, when the extension which they occupy is called their *place* and the change of their place gives their *motion,* or (*b*) in relation to each other, when, α if inclusive, they originate the relation of *containing* and *contained,* β if coëxclusive, that of *situation.* The inability to conceive as nonexistent what has once been conceived as existent in space affords the *ultimate incompressibility* of matter; and the primary qualities are all, as has been shown, dependent on space.

iii. *Intensive quantity, Intension or Degree,* is thought as applying not, like Time and Space, to substances, but to what, in the strictest sense of the term, are called *qualities.* *Firstly* in itself it is (*a*) positively inconceivable α *absolutely,* either as least or greatest, β *infinitely,* as without limit either in increase or in diminution; but it is (*b*) positively conceivable as *relative,* as indefinitely high or higher, low or lower. *Secondly,* the things thought under it, (*a*) if of the same intension, are correlatively uniform, (*b*) if of different, are correlatively higher or lower (*Discussions,* pp. 601–633; compare also II., pp. 366–413.)

SECOND PART OF PHENOMENAL PSYCHOLOGY—PHENOMENOLOGY OF THE FEELINGS.

The feelings of pleasure and pain are phenomena that accompany all our conscious existence; but since we consciously exist only inasmuch as we consciously exert our various powers, it must be in the conscious exercise of these powers that the phenomena of pleasure and pain arise. When the energy of a power is perfect, pleasure is the result; on the contrary, pain is felt when the energy is imperfect. Now an energy is perfect when it reaches the degree and duration of which the power is spontaneously capable, imperfect when it is strained beyond, or restrained within, that degree or duration. Pleasure is, therefore, a reflex of the spontaneous and unimpeded exertion of a power, of whose energy we are conscious; pain, a reflex of the overstrained or repressed exertion of such a power (II., pp. 435–440.)

With regard to the classification of our pleasures and pains, it is to be observed in general, that for every form of pleasure there are two of pain, one from restraint, the other from overstimulation. It is also to be noticed that both pleasure and pain may be either positive and absolute or negative and relative, the latter being pleasures and pains only by relation or contrast to a previous feeling (II., p. 442.) More specifically however the feelings may be divided into *Sensations* or those which accompany the exercise of bodily functions and *Sentiments* or those of a purely mental character. The former may be subdivided in accordance with the organs or senses through which they are received; the latter into *contemplative*, or those which accompany cognition, and *practical*, or those which accompany conation. Each of these classes, moreover, is capable of further subdivision corresponding to the distribution of our cognitive and conative powers (II., pp. 476–520).

THIRD PART OF PHENOMENAL PSYCHOLOGY—PHENOMENOLOGY OF THE CONATIONS.

The Conations are tendencies to action and are divisible into two classes according as the tendency is blind and fatal or deliberate and free. The former is *desire*, the latter *volition* (I., p. 185.)

I. The *desires* may be subdivided according to their objects, for they relate either (1) to Self-preservation, or (2) to the Enjoyment of of Existence, or (3) to the Preservation of the Species, or (4) to our Tendency towards Development and Perfection, or (5) to the Moral Law (II., p. 517.)

II. *Will* is a free cause, a cause which is not also an effect, a power of absolute origination. (*Discussions*, p. 623). That it is so, is not only affirmed by an immediate testimony of our consciousness to the fact, (I. p. 33; *Reid's Works*, p. 624, note, and pp. 616–7, notes), but is indirectly implied in our consciousness at once of an uncompromising law of duty, and of our being the morally accountable authors of our actions (I. p. 33; *Discussions*, pp. 623–4). This fact is indeed positively inconceivable: for (1) not only does the Law of the *Conditioned in Time*, under the form of the Law of Causality, render impossible the conception of an absolute origination; but (2) while on the one hand the determination of the will by motives can be conceived only as a necessitation which would render moral accountability impossible, on the other hand a motiveless volition would be quite as worthless morally. *(Ibid)*. Still the Law of the Conditioned is a law not of things, but merely of thought; and as its necessity in thought arises not from a power, but from a powerlessness of the mind, it cannot subvert the positive testimony of consciousness to the fact that we are free (*Ibid.*)

SECOND DIVISION OF PHILOSOPHY.—NOMOLOGICAL PSYCHOLOGY.

This division of philosophy investigates the mental phenomena with the view of discovering not their contingent appearances, but their necessary and universal laws; and consequently, like the first division, it may be subdivided in accordance with the three-fold distribution of the mental phenomena.

FIRST PART OF NOMOLOGICAL PSYCHOLOGY.—NOMOLOGY OF THE COGNITIONS.

Of the laws by which the Cognitive faculties in general are regulated we have no one science, though for such a science the name *Gnoseology* or *Gnostology* would not be unsuitable. Of the laws of Perception the science, if it existed, might be called *Aesthetic*, had that name not been already usurped by another. The science of the laws of Memory has been elaborated in numerous treatises under the name of *Mnemonic;* but it might equally well be called *Anamnestic* or the art of Recollection. Neither the laws of the Representative, nor those of the Regulative faculty have been reduced to scientific system, though on the latter of these we have several treatises under the name of *Noologies*. The only cognitive faculty, whose laws constitute the object-matter of a separate science, is the Elaborative,—the Understanding Special, the faculty of Relations or of Thought Proper. This nomology has been generally called Logic, but its best name would have been Dianoetic. To the same head might be referred *Universal* or *Philosophical Grammar*, that is, the science conversant with the laws of Language as the instrument of thought (I. pp. 122–3).

SECOND PART OF NOMOLOGICAL PSYCHOLOGY.—NOMOLOGY OF THE FEELINGS.

The laws, which govern our capacities of enjoyment, in relation to the end which these propose, namely the *Pleasurable,* has been denominated, especially on the Continent, Aesthetic; but the term *Apolaustic* would have been more appropriate (I. pp. 123–4.)

THIRD PART OF NOMOLOGICAL PSYCHOLOGY.—NOMOLOGY OF THE CONATIONS.

The Nomology of our Conative powers, to which the name of Practical Philosophy may most properly be applied, is the science of the laws regulative of our Will and Desires in relation to their end, namely the *Good.* Contemplating man as an individual, this science is called *Ethics;* contemplating him as a member of society, it is called *Politics:* and these two branches admit of further subdivision (I. p. 124).

THIRD DIVISION OF PHILOSOPHY—INFERENTIAL PSYCHOLOGY.

Of existence in itself or existences in themselves we know and can know nothing immediately, for we can know things only as they appear to us, that is, not as *substances,* but as *phenomena,* not *absolutely,* but *in relation* to us and to our faculties. Moreover all that is thus capable of being known relatively is not necessarily relative to us: for (1) we can know only those properties of things which we have faculties of knowing and there may be properties knowable by other limited intelligences, to which we have no faculties adapted; and (2) even those properties which we do know are known not in their native purity, but only as they are modified by our faculties (I., pp. 140–8.)

Since then we know nothing but phenomena, the existence of substances, which these manifest to us, can be merely an inference from them (I., pp. 125, 138). Yet such inferences with regard to facts unknown in themselves may be rendered perfectly legitimate as necessary to explain known phenomena (I., p. 125). Of such inferences we may take as examples those which relate to (1) the Mind of Man, (2) the Universe we live in, (3) its Creator.

1. The *Mind* of Man, as already proved, possesses a power of self-determination; but the material universe is subject to an irresistible causation. The mind, therefore, cannot be explained as the result of material organisation, and its existence is consequently independent of the material organism with which it is associated (I., p. 29). That

it must outlive its organism is proved by the fact that we are moral agents and that there is a Moral Governor of the Universe who will ultimately bring goodness and felicity into accordance (I., p. 32).

2. The *Universe* is governed not merely by physical, but also by moral laws, since man is treated as responsible for his actions (I. pp. 32–3. Hence also there must be

3. A *Deity*, that is, an *Intelligent Creator and Moral Governor* of the Universe (I., pp. 26–8). The existence of a Deity is an inference from a certain kind of effects to a certain kind of cause (I., p. 26). The effect to be explained is the universe, including, of course, man. Now as we can know nothing of the absolute order of things, it is only in so far as that order is manifested in our experience that we can form any conclusion regarding what it is in itself (I., pp. 30–31). There are then two facts established within the range of our experience: (1) that intelligence, so far as we know anything of it, intelligence in ourselves is not the result of material organisation; (2) that we are governed as agents morally accountable for their actions. In the absolute order of things, therefore, we must conclude that intelligence precedes physical force, and that morality is a principle of government; in other words, that the Creator of the Universe is intelligent and its Governor moral (I., pp. 26–32).

Should these inferences ever be redargued, "the final recompense of our scientific curiosity would be wailing, deeper than Cassandra's, for the ignorance that saved us from despair" (I., p. 38).

MOLLUSCOUS ANIMALS.

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The division of the Animal kingdom indicated in the title, was made by the author of this paper the subject of several discourses addressed to the Canadian Institute during its last session, but which not having been intended for printing, were not committed to writing. A request from the Society that these communications might appear in the Journal has led to their substance being put together in the present form. What is here offered is but the introduction to inquiries respecting the true arrangement and affinities of the principal groups which have engaged the author's attention, and the results of which, if opportunity is allowed, he hopes to bring before the public in one or two following papers.

Mollusca, (soft bodied animals) is one of the four sub-kingdoms or great branches of the Animal kingdom established by Cuvier, and adopted by most modern naturalists, many of them, however, recognizing a fifth sub-kingdom, named Protozoa: We will first consider the characteristics and the true limits of Mollusca; then its relations to the other sub-kingdoms, and afterwards the classes into which it is properly divided, with their sub-divisions. The treatment of the subject is in harmony with the views, already defended by the author respecting the classification of organised beings, but so far is he from being conscious of any straining of facts to produce this harmony, that it is to him only an additional illustration of a great universal law, presenting itself at once to the view of the careful observer.

Mollusca are unsegmented animals of a sac-like figure, the viscera being enclosed in a common envelope called the mantle; with a nervous system of one or several ganglia, when more than one, unsymmetrically disposed; and with motory apparatus formed by various modifications of the parts of a single central foot.

When we consider that both Vertebrate and Articulate animals are segmented internally or externally and have their nervous ganglia, so far as developed, doubly serial, belonging to the several segments; that Radiate animals consist of a set of merosomes in each of which the same functions are performed, whirled round a common axis, in which a common alimentary sac or canal is placed, and with equal provision of nervous power for each merosome; whilst Protozoa have a sarcode body, with no distinct nervous system, and the lowest differentiation of functions, but without either serial segmentation or any tendency to the assemblage of distinct approximately equal merosomes to form a common body belonging to a distinct animal, we shall see that the definition given above, whilst applicable to the whole Molluscan series, abundantly distinguishes it from all other animals.

Respecting the true limits of the sub-kingdom Mollusca, there may be three points which claim some passing notice, though only one of these remains a subject of discussion among naturalists of the present day. 1. Linnæus, in conformity with views prevailing in his time, placed the barnacles and acorn shells among the Mollusca, in his division Multivalve shells: even Cuvier allowed them, though as a separate order, to retain this connexion, and if La Marck made them a class, the gain was not great as they were but a class of Invertebrate animals—a confused ill-defined assemblage, in which the grand distinctions of Articulate, Molluscous and Radiate animals are neglected. Few modern naturalists hesitate about placing Cirrphopoda, the barnacles, &c., as a division of the class Crustacea among Articulate animals. Their belonging to the Articulate sub-kingdom is no longer questionable.

2. There is a group of minute animals, in outward appearance much resembling Hydroid polypes, of which they were considered as a section, which, on a careful examination of their structure, are found to constitute a low form of Molluscous animals, and under the name of Polyzoa, or Bryozoa, are accounted a class or sub-class of Mollusca. We may have to consider as we proceed, their precise position and rank, but it is no longer disputed that they belong to the series which forms our present subject.

3. A question has of late been raised, and is still in controversy among the most eminent living naturalists, whether the great series of animals which fall under the definition I have proposed, and which are generally spoken of as Mollusca, should continue to be regarded as *one* sub-kingdom or branch, or ought to be divided into two portions, each claiming that rank. It is maintained by some that such a division is rendered necessary by sufficiently important distinctions, and it is proposed to retain the name Mollusca for the higher division, and to call the other Molluscoida.

It must, of course, be remembered that in every great division we have to expect, with uniformity of general structural plan, both various adaptations to different modes of life, and all possible grades of development from the highest to the lowest which are reconcileable to the common plan. So long then as we can trace the common plan we ought to be so far from separating its lower from its higher grades that the extent of variations of this kind should assist us the better to appreciate the importance of the general characters, and impress the common relationship more strongly on our minds. A Polyzoan and a Gasteropod, may be pretty widely separated, but I confess I cannot understand the perceptions on these subjects of the man who fancies them separated by the same kind of distinctions as either of them and any Articulate. It is true we must not expect that all our groups, even those which we place in equal rank, should have equally important and well-marked characters; but we surely ought to be able to distinguish between difference of general plan and difference in the mode of carrying it out, or in the grade of development. I cannot but think that the eminent naturalists who insist on the separation we are considering, do really perceive and admit, as indeed the name they have employed conveys, the peculiarly close relationship of Mollusca and Molluscoida, but they fancy the distinction may assist the student and they do not attach the kind of importance which we do to the grand differences of plan amongst organised beings. They are probably of those who regard all classification as a mere human contrivance intended to aid our judgment and memory, but having no connection with the realities of nature; whilst to us, it is an attempt at the true interpretation of the Divine plan and not a record merely, but an embodiment of the knowledge gained of the real relations of organised beings. To us it appears that the five sub-kingdoms express the great fact that five distinct plans of structure are manifest in the animal kingdom, and unless we were brought to perceive another plan as distinct as any of these, which, we believe, no one will pretend to have found, we could admit no alteration in the general outline of the animal kingdom which has been so clearly marked out. I might add that no clear definitions of the proposed separate sub-kingdoms have been laid down, and that it is even left doubtful where the line should be drawn. I do not think, however, that further discussion of this point can be needed. We will proceed to speak of the relations of the Mollusca with the other sub-kingdoms; and here it is obvious that, whilst a gradation is observable from highest to lowest, relations of some parts of each to parts of the others are equally manifest. It is also to be noticed that in each sub-kingdom there is a gradation from the highest condition which the common type allows to the lowest that is at all consistent with it. Thus, for example, the lowest vertebrates are considerably inferior to the greater number of Articulates, Mollusks and even many Radiates; and there are members of even the highest class of Articulates which, though their type is sufficiently perceived, are in actual development scarcely raised above Protozoa. There can be no doubt of Vertebrata occupying the highest position in the animal kingdom, since both the average elevation of its members is far above that of the other sub-kingdoms, and its type admits, when most fully developed, of an incomparably higher condition than any of the others. It is equally certain that Protozoa must have assigned to them the lowest position as representing only the rudimentary or embryonic condition of all other animals.

Hence the unwillingness manifested by some to admit this sub-kingdom, the supposition being adopted that all its members may be only degraded forms of some of the others. Since, however, many of them are known to pass through a definite series of changes constituting a life history, whilst retaining all through the characteristics of the supposed sub-kingdom, and displaying no trace of the peculiar type of any of the higher ones; since, even in their great simplicity of structure they can be thrown into well-distinguished classes; and since analogy with what is found in each of the other sub-kingdoms would create an expectation of meeting with an Embryonic type, as well as those representing different tendencies of developement, the balance of probability is, on the whole, greatly in favour of the fifth sub-kingdom. The proper order of the remaining three great branches of the animal kingdom is not very difficult of determination, although some writers of very high authority may have fallen into error respecting it. We often find Mollusca placed next to Vertebrata, and we find it not unfrequently asserted that Articulata and Mollusca stand in equal relation to the higher branch and should be placed one on each side below it. Without doubt the cartilaginous brain case of the highest class of Mollusks suggests a comparison with Vertebrates, sufficient at least to afford another proof of these being the highest in the Molluscan series, but if we inquire concerning the general characteristics of the sub-kingdoms, we must perceive that the segmented structure of Articulata, their general higher development of the nervous system, and the prevailing predominance in them of muscular energy raise them above Mollusca, which are generally sluggish, and in which the nutritive system is evidently the most developed. We may then assume the true order of the greatest divisions of the animal kingdom to be, 1st, Vertebrata; 2nd, Articulata; 3rd, Mollusca; 4th, Radiata; 5th, Protozoa. To the first belong the highest power—the greatest development of the brain and of the organs of sense; to the second, the greatest degree of muscular development and its result activity. To the third, peculiar development of the nutritive system, with diminished tendencies to violence or to motory efforts. The 4th exhibits a lower modification of the nutritive system tending towards the vegetative or absorbent mode of obtaining food, whilst the fifth represents the lowest or embryonic condition of life. If we assume these characteristics of the greater divisions of the animal kingdom, to be repeated under each of them, always in consistency with the special type of each, and to be again repeated under each subdivision as far as divisions are required, we shall have a scheme of classification expressing a general system prevailing throughout nature, and which would produce at once the differences, the affinities, and the analogies which are actually observable. This general idea has in fact been attained by observing how in all parts of the animal kingdom, the best arrangements proposed, those which put the objects together in the most intelligible and satisfactory order, almost constantly present the same number of divisions of any given rank, analogies between corresponding divisions in different groups continually striking the mind, and when once the general idea had been obtained, its power in suggesting improvements and removing difficulties, proving so remarkable as most strongly to confirm the truth of the principle and encourage its extended application. In what follows I shall explain its application to the Molluscous sub-kingdom confining myself at present to the consideration of its classes and sub-classes not without hope of illustrating on a future occasion the orders, families, and sub-families.

The following important groups laying claim to the rank of classes have been pointed out amongst the Mollusca, proper attention to which may probably lead us to a right conclusion as to those which it is proper to admit: 1st, Cephalopoda, the Nautilus, cuttle-fish and Ammonite tribe; 2nd, Pteropoda, so called from their wing-like organs of motion, reduced by some under Gasteropoda, by others placed in a lower position, but in my view properly occupying the position usually assigned to them; 3rd, Heteropoda of Cuvier a small anomalous group, now generally, and I think justly, regarded as an order of the following class; 4th, Gasteropoda, the crawling Mollusca generally, with a few swimmers evidently resembling them in structure constituting the most numerous and the most typical division of the sub-kingdom; 5th, Lamellibranchiata, sometimes called Conchifera, Mollusks generally covered by a pair of shells; 6th, Brachiopoda of Cuvier, often and perhaps better called Palliobranchiata to mark the distinction in the mode of aeration from the preceding group; 7th, Tunicata; 8th, Polyzoa often spoken of by a name given soon after the original one, Bryozoa.

Before I examine more particularly the pretensions of these supposed classes, it may be useful to explain the meaning and use of subclasses in the arrangement of the animal kingdom. It is as a matter of fact, not unfrequently found, that where the structure corresponds in the main, and essentially conforms to the same type, there may be distinguished two or more grades of development, in each of which analogous secondary groups occur, so that they resemble classes differing more in degree than in kind, and bound together by a strong and well-marked resemblance, though each having its own secondary divisions. In such cases, the numerous objects all formed on a common plan, are accounted as one class, whilst the different grades of development mark sub-classes. In illustration we may refer to Owen's view of the classification of Mammalia where the great divisions founded on the character of the brain, which, though strongly objected to by some, are probably good, may be accounted as sub-classes, and under each of them great families corresponding in number and analogous in structure and habits may be pointed out. Again in the Classification of Birds, the great division of Perching birds is clearly one sub-class, whilst the remainder of the received orders form another, and the secondary divisions of the perchers correspond with the other orders. The same might be shown in the case of Fishes, and there are other well established examples. Now no one can well doubt that the class Cephalopoda exhibits the highest development and the greatest perfection of the organs of sense among the Mollusca. It is scarcely less certain that the Pteropoda excell all other Mollusca in activity and muscular power, and form, though a small, a very distinct class corresponding in position with the Articulata among the Sub-kingdoms. Cuvier's Heteropoda being disposed of in the manner already indicated, we come to Gasteropoda, the special nutritive type, corresponding with Mollusca among the sub-kingdoms and thus as being peculiarly typical, the most numerous and varied of all the classes.

It seems highly probable that all the remaining Mollusca, which are without a distinct head, constitute two classes, according as they have the mantle split open, its portions being covered by a pair of shells meeting in a hinge; or forming an undivided sac, with incurrent and excurrent openings, and its surface either of leathery or horny consistency. In each case we have two sub-classes, distinguished by the mode of aeration and of introducing the water-currents by which both air and nutriment are supplied to the creature. The 4th class, Conchifera, representing the type of vegetative or absorbent nutrition, has as its two sub-classes Lamellibranchiata and Palliobranchiata, in the former of which the aeration is effected by distinct lamellae or folds in which the blood-vessels are distributed, and the edges of the mantle are more or less separated with usually a large foot which can be protruded beyond the bivalve shell; in the latter the aeration is accomplished in the mantle itself, in which the vessels are distributed, and instead of the currents being produced chiefly by marginal fringes or cilia around the incurrent orifice where the mantle is united to form tubes, a singular development, apparently homologous with the foot, of two, generally spiral, ciliated arms serves to draw in the water required both for nutriment and aeration causing it to pass over the mantle and through the alimentary canal. There is unquestionably a striking analogy between the arms of Palliobranchiata and the ciliated border of Polyzoa, the cases in which the latter assumes the horse-shoe form establishing their common nature, and it may justly be inferred that this is the lowest form of the contrivance for introducing water containing both air and food, which consists of minute animalcules and decaying animal and vegetable matters, into the system of acephalous Mollusks, but that it does not indicate the closest relationship between Palliobranchiata and Polyzoa may be concluded from the seemingly superior importance of the points in which they differ, and which connect thom respectively with two well-marked classes.

The fifth and last class, Tunicata represents the lowest development of the Molluscan type, and is characterized by the sacciform mantle and the aeration being effected either simply by the water passing over the interior of the sac in a perpetually renewed flow, or in the higher forms by means of a fenestrated special organ over which the vascular system is distributed, within and around which the water is made to pass. In the lower sub-class, Polyzoa, the external surface is firm and translucent and the incurrent opening is enlarged, (as if by a protrusion of the branchial sac of the Ascidioid Tunicata), with a border of minute rays which are finely ciliated, and it is even probable that here the aerating process is chiefly carried on. In the higher sub-class, Tunicata proper, the outer covering is very generally flexible, sometimes soft and transparent, the branchial sac is included, and its openings surrounded with minute cilia, the incurrent and excurrent tubes instead of issuing from a common opening in a case covered by a hard envelope as in Polyzoa have sometimes separate remote outlets in the mantle. A low condition of the nervous system is found throughout this class, and indeed in the preceding, especially in the lowest sub-class. In that which we are now speaking of the union of many individuals in clusters having a common vitality is frequent, among the Polyzoa all but universal. This is accompanied by gemmation as an auxiliary means of extending the species, and in some instances we have also the phenomenon of alternate generations, a certain proof of the low position of the organisms in which it is observed.

On the whole it appears that the real number of classes in the Molluscous series corresponds with that of the sub-kingdoms themselves, whilst these classes show in their peculiar habits and structure, analogies with the several sub-kingdoms according to their order. There are manifest common characters but these are modified to suit different modes of life and grades of development so as to unite uniformity of general plan, with that variety in its adaptation to particular conditions which may arise from the modification of organs and principles common to all animal life, and which mainly consists in the predominance in each case of some one of a definite set of tendencies of development some one of which must in each case prevail over the others.

CANADIAN INSTITUTE.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1865-66, FROM 1ST DECEMBER, 1865, TO 30TH NOVEMBER, 1866, INCLUSIVE.

The Council of the Canadian Institute have the honor to present the following report of the proceedings of the Society for the past year:

I. MEMBERSHIP.

The present state of the membership is as follows:—

Members at commencement of Session, December, 1865	396
New Members elected during the Session, 1865-66	13
Total	409

Deduct deaths	7	
Withdrawn	8	
Left the Province	4	
Non-Payment	6	
		25
Total, 30th November, 1866		384
Composed of Honorary Members	4	
Life Members	30	
Corresponding Members	5	
Junior Members	1	
Ordinary Members	344	
Total		384

II. COMMUNICATIONS.

The following list of Papers, read at the ordinary meetings held during the Session, will be found to contain valuable communications, including some of general interest.

2ND DECEMBER, 1865.

Rev. Prof. W. Hincks, F.L.S., &c.: "On Chorisis as a means of explaining certain phenomena of Plants."

Rev. J. McCaul, LL.D.: "On ancient Factions at Rome and Constantinople."

Prof. Croft, D.C.L.: "Exhibited Pharaohs Serpents and explained their construction and composition."

16TH DECEMBER, 1865.

Prof. J. B. Cherriman. M.A.: "On recent experiments in aerial Navigation."

A. M. Rosebrugh, M.D.: "Exhibited a Series of Micographic Photographs, and enlarged Photographs of Micographic objects, executed by Mr. Hollingworth and presented by him to the Institute. He explained the nature of the process and the construction of the camera. He also exhibited some enlarged photographs of micographic objects projected by the Magic Lantern."

6TH JANUARY, 1866.

Prof. E. J. Chapman, Ph. D.: "Remarks on some minerals from Lake Superior.'

Rev. Prof. Hincks, F.L.S., &c.: "Remarks on some Canadian Birds, with exhibition of Specimens."

13TH JANUARY, 1866.

Rev. Prof. Hincks, F.L.S., &c.: "Exhibited a specimen of the Pintailed Grouse shot near Sault St. Marie, and made some observations thereon."

Prof. D. Wilson, LL.D., read a paper entitled: "Notes of a visit to Mal Bay on the St. Lawrence, exhibited some illustrative sketches and made some observations, Geological and Historical thereon.

27TH JANUARY, 1866.

U. Ogden, M.D.: "On the Propogation and Prevention of Cholera."

3RD FEBRUARY, 1866.

A. M. Rosebrugh, M.D.: "On some of the Optical defects of the eye; and their treatment with the Scientific use of Spectacles."

G. H. Wilson, Esq.: "Exhibited two medals, viz: one of the Church of St. Paul, Rome, and one of St. Peter and St. Paul, Philadelphia."

10TH FEBRUARY, 1866.

Rev. Prof. Hincks, F.L.S., &c.: "Some thoughts on Classification in relation to organized beings."

17TH FEBRUARY, 1866.

Rev. H. Scadding, D.D.: "Received Misprints; or, Traditional Errors in Typography."

24TH FEBRUARY, 1866.

Prof. D. Wilson, LL.D.: "Alphabetical History."

3RD MARCH, 1866.

Rev. J. McCaul, LL.D.: "Municipal Electioneering in Ancient Italy."

10TH MARCH, 1866.

W. H. Cumming, Esq., M.D.: "The Amoy Colloquial."

17TH MARCH, 1866.

Prof. D. Wilson, LL.D.: "On a Peculiar Class of Devices occuring on certain Rocks and standing Stones in Britain."

Prof. E. J. Chapman, Ph. D.: "On some Canadian Illustrations of Geological Phenomena."

24TH MARCH, 1866.

Rev. Prof. W. Hincks, F.L.S., &c.: "Notes on some practically interesting questions in economical science, bearing on the prosperity of a country situated like ours."

7TH APRIL, 1866.

W. H. Cumming, Esq., M.D.: "The Density of the Population of China, with the check to its indefinite increase."

14TH APRIL, 1866.

Prof. D. Wilson, LL.D.: "On the origin of certain peculiar skull forms from premature ossification of sutures."

III. Report of the Editing Committee ....none.. 4
IV. Curator's Report......................................none.. 5
V. Librarian's Report ....none.. 6
VI. Report of Medical Section. ....none.. 7
VIII. Entomological Society's Report ....none.. 9

STATEMENT OF THE CANADIAN INSTITUTE GENERAL ACCOUNT FOR THE YEAR 1865-66, FROM THE 1ST DECEMBER, 1865, TO THE 30TH NOVEMBER, 1866.

DR.

Cash balance last year	$294 22
" received from Members	577 00
" for Rent, Taxes, &c	16 20
" for sale of Journal	12 00
" " of old Gaspipe	1 50
" Parliamentary Grant, 1866	750 00
" Due by Members	1701 25

" Due by Journal	Old Series	$114 25	183 75
	New Series	43 25	
	Mr. Edwards, for Paris Exhibition.	26 25	
" Due by Interest on Securities			186 00
			$3721 92

Cr.

Cash paid for Journal, 1865	$422 25	
" " " 1866	265 86	
		$688 11
" paid for Library and Museum		107 30
" " account of Sundries (Institute)		749 93
" due on account of Journal		322 40
" due on account of Sundries		70 00
Estimated Balance		1784 18
		$3721 92

Treasurer in account with the Canadian Institute for the year 1865–66, *from the* 1*st December*, 1865, *to the* 30*th November*, 1866.

Dr.

Cash balance last year	$294 22
" received from Members	577 00
" " for Rent, Taxes, &c	16 20
" " for sale of Journal	12 00
" " for sale of old Gaspipe	1 50
" " Parliamentary Grant	750 00
Securities	3100 00
	$4750 92

Cr.

Cash paid on account of Journal, 1865	$422 25	
" " " " 1866	265 86	
		688 11
" " for Library and Museum		107 30
" " for Sundries (Institute)		749 93
Securities		3100 00
Balance in hand		105 58
		$4750 92

G. H. Wilson, } *Auditors.*
W. J. MacDonell, }

APPENDIX.

* Thus marked not bound.

DONATIONS OF BOOKS, &c., RECEIVED SINCE THE LAST ANNUAL REPORT.

From Hon. J. M. Broadhead, Washington, D. C., U. S.

Diplomatic Correspondence, 1861. Department of State	1
Diplomatic Correspondence, 1862. Department of State.—Parts 1 and 2	2
Diplomatic Correspondence, 1863. Department of State.—Parts 1 and 2	2
Diplomatic Correspondence, 1864. Department of State.—Parts 1, 2, 3 and 4.	4

From Nova Scotia Institute, Halifax.

Journal and Proceedings of the House of Assembly of the Province of Nova Scotia. 2nd Session. 23rd General Assembly Session 1865. 28th Victoria.	1

From the Office of Routine and Record, Canada.

Statutes of Canada 1865. 2nd Session, 29th Victoria, 1865	1
Statutes of Canada 1866. 2nd Session, 29th and 30th Victoria, 1866	1

From the Royal Irish Academy, Dublin.

Proceedings of the Royal Irish Academy, Vol. 7—1857—1861	1
Proceedings of the Royal Irish Academy, Vol. 8—1861—1864	1

From the Secretary to the Government of India.

Bombay Magnetical and Meterological Observations 1863	1

From Smithsonian Institute, Washington, D. C., U. S.

Jahrbücher des Vereins für Naturkunde &c. Wiesbaden, Germany, 1862—1863.	*1
Meteorologische Waarnemingen in Nederland en zijne Bezittingen, &c., 1864	1
Acta universitatis Lundensis, 1864. Mathematik och Naturvetenskap Lund, 1864–5	*1
Philosophi, Sprákvetenskap och Historia	*1

From L. Heyden, Esq. Junior, Toronto.

Pacata Hibernia, the 1st Booke of the Warres in Ireland, 1599, by Thomas Stafford, Vols. 1 and 2	2
Views of Society and Manners in America, in a Series of Letters from that Country to a friend in England. Years 1818—19 and 20, by an Englishwoman, London, 1821	1

From the Provincial Secretary of Canada.

Geological Survey of Canada. Report of Progress from its commencement to 1863. Atlas of Maps and Sections, with an Introduction and Appendix, Montreal, 1865	1

From Superintendent of Education Lower Canada.

Etudes Philologiques Sur Quelques Langues Sauvages de L'Amerique. Par N. O., ancien missionnaire	*1

DONATION OF PAMPHLETS, SHEETS, &c.

From the Author.

The Annual Address of the President of the Royal Society, General Sabine, R. A 30th November, 1865	1

From the Natural History Society of New Brunswick.

Preliminary Report of the Geology of New Brunswick, by H. Y. Huid, M.A.	1

From the Royal Irish Academy, Dublin.

Transactions, Vol. 24 Antiquities. Part II., 1864	1
" " III., 1864	1
" " IV., 1865	1
Science " IV., 1864	1
" " IV., 1865	1
Polite Literature " II., 1865	1
Proceedings of do Literature, Vol. IX. Part I., 1864	1

From the Smithsonian Institute, Washington, D. C., U. S.

Researches on Solar Physics, by Warren De La Rue, Esq, Ph. D., F.R.S., Pres. R.A.S.; Balfour Stewart, Esq., M.A., F.R.S., Superintendent of Kew Observatory; and Ben Lowry, Esq., Observer and Computer to the Kew Observatory	1
Funfzigster Jahresbericht der Naturforschenden Gesellschaft in Emden, 1864 Von Herman Meier, Sekretar	1
Erster Jahresbericht des naturwissenschaftlichen Vereines zu Bremen	1
Observatory. 1st Series on the Nature of Sun Spots	1
Bweiter Jahresbericht des Vereins für Erdfunde zu Dresden	1
Erster " " " " "	1
Mittheilungen der Kaeserlich-Königlichen Geographischen Gesellschaft, &c. Wien, 1864	1

DONATIONS, PAMPHLETS, SHEETS, &c.

Nyt magazin for Naturvidenskaberne udgives af den physiographiske Forening i Christiania ved M. Sars og Th. Kjerulf, Trettinde, 1864	1
Do Fjortende Binds forste Hefte, 1865.	1
Foreningen tir Norske Fortids mindesmerkers Bevaring, 1864	1
Gaver til det Kongl Norske universitets Bibliothek i Christiania, 1863	1
Det Kongelige Norske Frederiks universitets aarsberetning for aaret, 1863	1
Norske Fornlevninger, en oplysende Fortegnelse over norges. Fortidslevninger, aeldre end reformationen og henforte til Hver Sit Sted. af N. Nicolaysen Fjerde Hefte, 1865.	1
Gaver til det Kgl. Norske univirsitet i Christiania, 1862	1
Norges Ferskvandskrebsdyr. Forste afsnit. Branchiopoda I cladocera ctenopoda, &c., af Georg Ossian Sars	1
Norkske Bygninger fra fortiden (Norwegian buildings from former times), 1864	1

From McGill College, Montreal.

Calendar of Session of 1866–7	1

From the Chicago Historical Society.

Intramural Interments in Populous Cities, by J. H. Rauch, M. D.	1
7th and 8th Annual Report of the Chicago Trade and Commerce, 31 March 1865. 31 March, 1866	2

8th Annual Report of the Eye and Ear Infirmary of Chicago, 1, May, 1866...	2
5th " " of the Board of Public Works—ending March 31st—1866.	1
12th " " of the Board of Education, Sept. 1st 1865, to Aug. 31st 1866	1
School law of 1865—An act to establish and maintain a system of Free Schools in the State of Illinois—Feb. 16th, 1865	1
Ninth Biennial Report of the Trustees, Superintendent and Treasurer of the Illinois State Hospital for the Insane at Jacksonville—Dec., 1864	1
Inaugural address of Richard J. Oglsey, Governor of Illinois, to the General Assembly—Jan. 16th, 1865	1
Tenth Biennial Report of the Illinois Institution, for the Education of the Deaf and Dumb, by the Directors and Principal, for the years 1863 and 1864	1
Report of the Illinois State Penitentiary, by the Commissioners for the years 1863 and 1864	1
Eighth Biennial Report of the Illinois Institution for the Education of the Bludi located at Jacksonville, for the years 1863 and 1864	1
Report of Col. T. P. Robb, Illinois State Sanitary Commissioner, on the Sanitary Condition of Illinois Troops and field and General Hospitals in the armies and departments of the Ohio, Tennesse, Cumberland, and division of West Mississippi	1
Message of His Excellency Richard Yates, Governor of Illinois, to the General Assembly—Jan. 2nd, 1865	1
Report of the Adjutant General of the State of Illinois—1st Jan., 1865	1

DONATIONS OF PAMPHLETS, SHEETS, &c.

FROM BUREAU OF AGRICULTURE AND STATISTICS.

An Act respecting the preservation of the Public Health, 22 Victoria, Cap. 38.	1
The Irish Position in British and in Republican North America—A letter to the Editors of the Irish Press, irrespective of Party, by the Hon. Thomas D'Arcy McGee—2nd Edition	1
Memorandum on Cholera	2

FROM HON. MR. CAMPBELL.

Geological Survey of Canada—Reports of Mr. A. Michael and Dr. T. Sterry Hunt, on the Gold Regions of Canada	2

UNKNOWN.

Biographical Sketch of Hon. Robert Charles Wilkins	1

FROM THE UNIVERSITY OF CHRISTIANIA.

Meteorologische Beobachtungen aufgezeichnet auf Christiania Observatorium. I. Band Letzte Lieferung 1837-63	1
Fiske—Udklaeknings apparater fra Norge, &c...	1
Meteorologische Jagttagelser Paa Christiania Observatorium 1864	1
Meteorologische Beobachtungen aufgezeichnet auf Christiania's Observatorium. III and IV Lieferung 1848-1855	1
Veiviser ved Geologiske Excursioner J Christiania omegn med et Farvetrykt Kart og flere Traesnit af Lector Theodor Kjerulf	1

Generalberetning fra Gaustad Sindssygeasyl for aaret 1864	1
Beretning om Bodsfaengflets Virksomhed i aaret 1864	
Beretning om Fisferi udstilliugen i nalefund 1864	1
Beretning om Ladegaardoens Hovedgaard for 1862 og 1863	1
Om de i Norge Forekommende Fossile Dyrelevninger fra Quartaerperioden et Bidrag til vor Faunas Historie af Dr. phil et med Michael zars	1

DONATIONS, PAMPHLETS, &c.

FROM PROFESSOR ALEXANDER WINCHELL, A.M., PROFESSOR IN THE UNIVERSITY OF MICHIGAN, &C.

The Grand Traverse Region—Report of the Geological and Industrial resources of the Counties of Auttim, Grand Traverse, Benzie and Leclanaw in the Lower Provinces of Michigan, Ann Arbor, 1866	1
A plea for Science: an address delivered in Morrison Chapel, Kentucky University, commencement day June 28th, 1866, by Alex. Winchell, Esq., M.A., Professor in the University of Michigan	1

From the Geological Survey of India, Dr. Oldham Superintendent per Mr. Allen, London.

Annual Report of the Geological Survey of India and the Museum of Geology, Calcutta, 9th year 1864–65	1
Catalogue of the organic remains belonging to the Echinodermata in the Museum of the Geological Survey of India, Calcutta, 1865	1
Memoirs of the Geological Survey of India. Stoluka F. Section across the N. Western Himalayas from the Sutley to the Indies, with descriptions of the Fossils	1
Mallet, F. R., the Gypsum of Lower Spiti, with a list of minerals collected in the Himalaya	1
Patleaontologia Indcia, being figures and descriptions of the organic remains procured during the progress of the Geological Survey of India. 4. 1. on vertabrate Fossils from the Panchet rocks, near Raningunj, Bengal, by Thos. Huxley, F.R.S., Prof. Natural History School of Mines, London	1
do do do do 3. 6. 9. The Fossil Cephalopoda of the Cretacious Rocks of Southern India, (Ammonitida) by Ferdinand Stoliczka Ph. D. Geological Survey of India	1
Medlieott A. B. on the coal of Assam, with Geological notes on the adjoining districts to the South	1

From the Connecticut Academy of Arts and Sciences.

Transactions of Vol. 1, No. 1	1

From Professor J. W. Dawson, LL.D., &c.,

On the conditions of the deposition of coal, more especially as illustrated by the coal formation of Nova Scotia and New Brunswick	1

Books Bought.

Carlyle's Frederick the Great, Vol. IV	1

Exchange for Journal.

Journal of the Society of Arts, London, 1866, 2 copies	1
Journal of Education, Upper Canada, 1866, 2 copies	1

Journal of Franklin Institute, Philadelphia, 1866	1
The Artizan, London, England, 1866	1
Silliman's Journal, 1866	1
Proceedings of Antiquarian Society, Boston, 1866	1
Transactions of the Academy of Sciences, St. Louis, 1866	1
Proceedings of the Academy of Natural Sciences, Philadelphia, 1866	1
Historical Recollections of the Essex Institute, and proceedings of Historical Recollections, 1866	1
Annales des Mines	1
Proceedings of Boston Natural Historical Society, 1866	1
Journal of the Board of Arts and Manufactures, Toronto, 1866	1
Annals Lyceum of Natural History, New York, 1866	1
Transactions of the Royal Society of Edinburgh	1
Journal of the Royal Geological Society of Ireland	1
Transactions of the Royal Irish Academy, and proceedings of 1864 and 1865.	1
Publications from the Chicago Historical Society	1
Publications from the University of Michigan	1
Publications from the Geological Survey of India	1

DONATIONS FOR THE MUSEUM, FROM 1st DEC. 1865 to 30th NOV. 1866.

By S. Thompson, Esq.

Gypsum found in Situ when sinking a well on Lot 8, 2nd Concession, Township of St. Vincent, County of Grey, Georgian Bay	1

By Mr. Hollingworth, Artist.

Specimens of Micographic photographs	9
Specimens of enlarged photographs of Micographic objects	11

By Dr. Stratford, New Zealand.

Titaneferous Iron Sand from the West Coast of North New Zealand, 160 miles long	1

[An apology is required for the late publication of the following Proceedings and Report. The present volume extends over a much longer time than usual, in consequence of which our materials have exceeded our available space, and we have delayed what seemed least immediately required.]

CANADIAN INSTITUTE.

Session—1865-66.

TENTH ORDINARY MEETING—*3rd March*, 1866.

Dr. J. N. Agnew, Vice-President, in the Chair.

I. *The following donations for the Library, received since last meeting, were announced by Secretary.*

From the Royal Irish Academy:

Proceedings of Vol. VII., 1857–1061, bound in cloth	1
" " VIII., 1861–1864 "	1
" " IX., Part I., pamphlet	1

Transactions of do. Vol. XXIV., Antiquities, Part 2, 1864	1
" " " " 3, 1864	1
" " " " 4, 1865	1
" " " Science, Part 4, 1864	1
" " " " " 6, 1865	1
" " " Polite Literature, Part 2, 1865	1

II. A Paper was read by Rev. Dr. McCaul, entitled: "Municipal Electioneering in Ancient Italy."

ELEVENTH ORDINARY MEETING—10*th March*, 1866.

Prof. G. T. Kingston, M.A., in the Chair.

I. Commissary-General Weir proposed at last meeting was elected a member.

II. *The following donations for the Library were received since last meeting.*

From Dr. Rosebrugh:

Optical defects of the eye	1

From the Government of the East Indies:

Bombay Magnetical and Meteorological Observations, 1863	1

III. A Paper was read by Dr. Cumming, entitled: "The Amoy Colloquial."

TWELFTH ORDINARY MEETING—17*th March*, 1866.

Dr. J. N. Agnew, Vice-President, in the Chair.

I. Dr. J. Pollock proposed at the last meeting was elected a member.

II. A Paper was read by Dr. Chapman, entitled: "Some Canadian Illustrations of Geological Phenomena," and Dr. Wilson a paper "On a peculiar class of Devices occuring on certain Rocks and Standing Stones in Britain."

THIRTEENTH ORDINARY MEETING—24*th March*, 1866.

D. J. N. Agnew, Vice-President, in the Chair.

I. A Paper was read by Rev. Prof. W. Hincks, F.L.S., entitled: "Notes on some practically interesting questions in economical science, bearing on the prosperity of a community situated like ours."

FOURTEENTH ORDINARY MEETING—7*th April*, 1866.

Dr. J. N. Agnew, Vice-President, in thd Chair.

I. *The following donations were announced since last meeting.*

For the Museum:

From S. Thompson, Esq., Specimen of Gypsum from County of Grey	1

For the Library, from Royal Society of Edinburgh:

Proceedings of, for 1864–65	1
Transactions of, for 1864–65	1

II. A paper was read by Dr. Cumming entitled: "The Density of the population in China, with the check to its indefinite increase."

III. Mr. Macdonald and G. H. Wilson were appointed auditors.

FIFTEENTH ORDINARY MEETING—14*th April*, 1866.

Dr. J. N. Agnew, Vice-President, in the Chair.

A paper was read by Dr. Daniel Wilson: "On the origin of certain peculiar skull forms from premature ossification of the sutures."

EXTRACT—MINUTES OF CANADIAN INSTITUTE—Session 1866-67.

FIRST ORDINARY MEETING—1*st December*, 1866.

Vice-President, J. N. Agnew, M.D., in the Chair.

I. The list of Donations of Books and Pamphlets received since the last meeting was laid on the table—Books, 10 Vols.—Pamphlets, 53.

II. A paper was read by Prof. D. Wilson—"Literary Forgeries."

SECOND ORDINARY MEETING—8*th December*, 1866.

Vice-President, G. T. Kingston, M.A., in the Chair.

The nomination of officers and council took place for year 1866-67.

ANNUAL GENERAL MEETING—15*th December*, 1866.

Vice-President, G. T. Kingston, M.A., in the Chair.

I. The following Gentlemen duly proposed at the last meeting for membership were balloted for and declared duly elected, viz.:

Dr. Constantinedes.
Dr. Fulton.
R. Baignet, Esq., Artist, Toronto.
J. Brown, Esq., M.D., Toronto.

II. The list of office-bearers and council is as follows:—

President,	Prof. H. Croft, D.C.L.
1st Vice-President,	Prof. J. B. Cherriman, M.A.
2nd Vice-President,	Dr. J. Agnew.
3rd Vice-President,	J. Thorburn, Esq., M.D.
Treasurer,	S. Spreull, Esq.
Recording Secretary,	W. M. Clark, Esq.
Corresponding do	Laurence Heyden, Jun., Esq.
Librarian,	Rev. H. Scadding, D.D.
Curator,	W. B. McMurrich, Esq., M.A.
Council,	Prof. G. T. Kingston, M.A.
Do	Prof. J. H. Sangster, Esq., M.D.
Do	Prof. W. H. Cumming, Esq., M.D.
Do	Prof. D. Wilson, LL.D.
Do	Prof. E. J. Chapman, Ph. D.
Do	C. B. Hall, Esq., M.D.

Prof. Hincks is also a member of Council, *ex-officio* as general editor of the Journal.

III. The Annual Report of the Council was read by the Treasurer.

The Report was unanimously adopted.

THIRD ORDINARY MEETING—12*th January*, 1867.

President, Prof. H. Croft, D.C.L., in the Chair.

I. The ballot having been taken for Dr. J. King and Dr. Newcombe, proposed for membership at the last meeting, they were declared duly elected.

II. The Canadian Institute and the Medical Section to meet alternately on Saturday nights.

III. The annual address was read by the President.

IV. *The following donations for the Library were announced having been received since last meeting of the Institute.*

Donor—L. Heyden, Esq., Jun., of Toronto:	
Consvetvdines Kañciæ Sandys, F.S.A., 1851	1
Ashe's Travels in America, Vols. 1, 2, and 3 in one	1
Rochefoucault's Travels in America, years 1795-96 and 1707, Vols. 1, 2, 3, 4.	4
Donors—Manchester Literary and Philosophical Society.	
Memoirs of, Vol. II., 1865	1
Proceedings of, Vol. III., Session 1863-64, and 1862-63	1
Proceedings of Vol. IV., Ses. 1864 and 1865	1
From Smithsonian Institute:	
Meteorologiske Jarbokc, &c	2
From Royal Geological Society of Ireland:	
Journal of Vol. 1, 2, 1865-6	1
From Royal Irish Academy:	
Transactions of Vol. XXIV, Antiquities, part 5	1
“ “ “ part 6	1
“ “ “ part 7	1
“ “ Science, part 5	1
“ “ Polite Literature, part 3	1
From Linnean Society:	
Journal of, Vol. IX, Zoology, No. 33, 1866	1
“ “ Botany, No. 35, 1865	1
“ “ “ No. 86, 1865	1
“ “ “ No. 37, 1865	1
“ the proceedings of Vol. 8, Nos. 31 and 32	1
List of the Linnean Society, 1865	1

FOURTH ORDINARY MEETING—26*th January*, 1867.

President, Professor H. Croft, D.C.L., in the Chair.

I. Mr. W. C. Adams and Dr. N. O. Walker, M.R.C.S.E., proposed at the last meeting, were balloted for and declared duly elected.

II. Specimens of animal remains, &c. from the Dordogne cave, were exhibited by Dr. Thorburn, and were described Geologically by Dr. Chapman, and Ethnologically by Professor D. Wilson.

FIFTH ORDINARY MEETING—9*th February*, 1867.

Vice-President J. N. AGNEW, Esq., M.D., in the Chair.

I. G. P. DeGrassi, M.B, and J. S. Scott, dentist, Cobourg, were elected members.

II. A paper was read by Dr. Tempest for Dr. Oronhitheka, "on nitrous oxyde as anesthetic."

SIXTH ORDINARY MEETING—23*rd February*, 1867.

President Professor H. CROFT, D.C.L., in the Chair.

I. Dr. Carlyle and Mr. Vandersmissen, proposed as members at last meeting, were balloted for and declared duly elected.

II. A paper was read by the Rev. Dr. McCaul—Subject, "Boys' and Girls' Homes among the Ancients."

SEVENTH ORDINARY MEETING—9*th March*, 1867.

President Professor H. CROFT, D.C.L., in the Chair.

I. A paper was read by Dr. C. B. Hall, "On Consumption."

EIGHTH ORDINARY MEETING—23*rd March*, 1867.

President Professor H. CROFT, D.C.L., in the Chair.

I. S. P. May, Esq., M.D., was elected a member of the Institute.

II. A paper was read by Dr. C. B. Hall, "On some chemical changes in the Human System."

NINTH ORDINARY MEETING—6*th April*, 1867.

President Professor H. CROFT, D.C.L., in the Chair.

I. The following donations were announced as having been received since last meeting.—

For the Library, from Hon. J. M. Broadhead, Washington, Patent Office Reports for 1864–65, Pts. 1 and 2, Vol. 2.

II. Dr. O. S. Winstanley, proposed at the last meeting, was balloted for and declared duly elected.

III. A paper was read by Professor Chapman, Ph. D., entitled, "Journey to the Rocky Mountains of Colorado, with remarks on the assaying of Gold and Silver ores."

TENTH ORDINARY MEETING—27*th April*, 1867.

President Professor H. CROFT, D.C.L., in the Chair.

I. E. B. Shuttleworth and John Ridout, Esqrs., proposed at last meeting, were balloted for and declared duly elected.

II. A paper in continuation of Remarks on Molluscous Animals was read by Rev. Professor Hincks—and also one by Professor D. Wilson, entitled, "Notes on the North Shore of Lake Superior and the Nepigon River."

GENERAL METEOROLOGICAL

Provincial Magnetical Observ

LATITUDE, 43° 39′ 4″ North; LONGITUDE 5h. 17m. 33s. West.—Elevation above

—	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JULY.
Mean Temperature	° 20.73	° 22.51	° 27.55	° 43.86	° 48.30	° 60.18	° 70.43
Difference from average (27 years)	− 2.56	− 0.44	− 2.37	+ 2.67	− 3.28	− 1.23	+ 3.39
Thermic anomaly (Lat. 40° 40′)	−12.07	−12.19	−12.55	− 6.34	− 9.80	− 4.42	+ 1.73
Highest temperature	44.0	45.0	45.8	71.0	73.4	90.5	94.0
Lowest temperature	−14.0	− 8.0	7.5	28.5	33.4	40.0	47.8
Monthly and annual range	58.0	53.0	38.3	42.5	40.0	50.5	46.2
Mean maximum temperature	26.32	33.61	33.0	52.87	57.55	69.47	79.60
Mean minimum temperature	12.70	18.12	21.65	36.01	39.79	51.41	60.64
Mean daily range	13.62	15.49	11.35	16.86	17.76	18.06	18.96
Greatest daily range	40.8	38.1	21.6	36.2	31.8	28.0	35.0
Mean Height of the barometer	29.7184	29.7069	29.6666	29.6094	29.4845	29.5205	29.6059
Difference from average (27 years)	+.0686	+.0841	+.0749	+.0096	−.0928	−.0494	+.0071
Highest barometer	30.940	30.364	30.089	29.972	29.866	29.907	29.915
Lowest barometer	29.110	29.126	29.043	28.927	28.919	28.967	29.305
Monthly and annual ranges	1.830	1.238	1.046	1.045	0.947	0.940	0.610
Mean humidity of the air	83	81	77	65	62	72	72
Mean elasticity of aqueous vapour	.101	.108	.124	.195	.212	.381	.535
Mean of cloudiness	0.76	0.82	0.65	0.58	0.54	0.54	0.50
Difference from average (14 years)	+ .04	+ .10	+ .03	− .01	+ .01	+ .02	+ .02
Resultant direction of the wind	N 75 W	S 80 W	N 73 W	N 42 W	N 46 W	S 15 W	S 79 W
Resultant velocity of the wind	2.98	5.14	6.84	3.34	4.49	0.71	0.94
Mean velocity (miles per hour)	9.34	9.40	11.51	7.95	9.26	5.09	4.17
Difference from average (19 years)	+1.18	+1.01	+2.68	−0.12	+2.59	−0.10	−0.78
Total amount of rain	0.522	0.830	1.915	1.675	2.820	2.720	5.390
Difference from average (26–27 yrs.)	−0.744	−0.156	+0.286	−0.787	−0.402	−0.109	+1.882
Number of days rain	4	3	8	7	13	15	16
Total amount of snow	10.3	16.9	7.2	Inapp.			
Difference from average (24 years)	− 4.63	− 1.05	− 2.23	− 2.29	− 0.08	...	...
Number of days snow	19	12	18	2			
Number of fair days	11	14	9	21	18	15	15
Number of auroras observed	3	3	8	1	7	1	3
Possible to see aurora (No. of nights)	11	11	14	18	24	19	25
Number of thunderstorms	0	0	1	1	2	8	7

REGISTER FOR THE YEAR 1866.

atory, Toronto, Canada West.

Lake Ontario, 108 feet; approximate Elevation above the Sea, 342 feet.

AUG.	SEPT.	OCT.	NOV.	DEC.	Year 1866.	Year 1865.	Year 1864.	Year 1863.	Year 1862.	Year 1861.	Year 1860.
60°.80 − 5.17 − 7.70	55°.22 − 2.77 − 6.28	49°.09 + 3.36 − 4.71	38°.36 + 1.48 − 4.84	25°.06 − 1.15 −10.94	43°.51 − 0.67 − 7.49	44°.02 + 0.74 − 6.08	44°.70 + 0.52 − 6.30	44°.57 + 0.39 − 6.43	44°.35 + 0.17 − 6.65	44°.22 + 0.04 − 6.78	44°.32 + 0.14 − 6.68
77.0 42.4 34.6	80.0 34.4 45.6	71.0 31.8 39.2	54.2 21.8 32.4	51.0 − 5.0 56.0	94.0 −14.0 108.0	90.5 −10.0 100.5	94.0 −15.0 109.0	88.0 −19.8 107.8	95.5 − 5.2 100.7	87.8 −20.8 108.6	88.0 − 8.5 96.5
69.64 52.72 16.92 27.1	64.00 48.73 15.27 24.5	57.56 43.83 13.73 24.8	43.83 33.17 10.66 24.2	31.20 20.04 11.16 33.8	... ... 14.99 40.8	... ... 15.43 36.9	... ... 14.57 37.4	... ... 14.73 39.6	... ... 14.43 37.0	... ... 14.42 33.3	... ... 14.24 30.7
29.5608 −.0626	29.6207 −.0397	29.7061 +.0622	29.6122 −.0005	29.6470 −.0089	29.6216 +.0041	29.6330 +.0155	29.5596 −.0579	29.6536 +.0361	29.6248 +.0073	29.6008 −.0167	29.5923 −.0252
29.977 29.258 0.719	29.936 29.142 0.794	30.210 29.082 1.128	30.372 28.855 1.517	30.313 28.807 1.506	30.940 28.807 2.133	30.354 28.707 1.647	30.327 28.671 1.656	30.502 28.704 1.798	30.469 28.805 1.664	30.330 28.644 1.686	30.267 28.838 1.429
73	78	75	80	79	75	75	76	77	77	78	77
.390	.349	.272	.192	.118	.284	.259	.263	.266	.262	.262	.260
0.56 + .09	0.57 + .07	0.50 − .12	0.72 − .02	0.63 − .11	0.61 .00	0.61 .00	0.65 + .04	0.61 .00	0.63 + .02	0.62 + .01	0.60 − .01
N 59 W 2.58 5.16 −0.01	N 33 W 1.45 4.63 −0.79	N 30 W 0.84 5.53 −0.48	N 88 W 3.06 6.96 −0.49	S 88 W 4.98 9.91 +1.56	N 73 W 2.83 7.41 +0.52	N 66 W 1.98 6.78 −0.11	N 76 W 2.49 7.40 +0.51	N 41 W 1.34 7.13 +0.24	N 48 W 2.03 7.33 +0.44	N 56 W 2.11 7.47 +0.58	N 60 W 3.32 8.55 +1.66
4.457 +1.412 14	5.657 +1.902 15	2.470 −0.064 11	2.963 −0.095 13	2.790 +1.101 7	34.209 −4.226 126	26.599 −3.384 111	29.486 −0.497 132	26.483 −3.500 130	25.529 −4.454 118	26 995 −2.988 136	23.434 −6.549 130
...	...	Inapp. − 0.87 1	2.2 − 0.80 4	15.5 + 1.17 13	51.1 −10.78 69	63.3 + 0.42 68	74.6 +11.72 70	62.9 + 0.02 74	85.4 +22.52 72	74.8 +11.72 76	45.6 −17.28 75
17	15	19	13	13	180	201	180	181	189	165	174
4	3	8	2	1	44	55	34	44	48	43	58
17	19	22	11	18	209	201	158	182	176	180	190
1	3	1	0	0	24	17	20	24	24	27	30

TEMPERATURE.

	1866.	Average of 27 years.	Extremes.	
Mean temperature of the year	43°.51	44°.18	46°.36 in '46.	42°.16 in '56.
Warmest month	July.	July.	July, 1854.	Aug. 1860.
Mean Temperature of the warmest month	70.43	67.04	72.47	64.46
Coldest month	January.	February.	Jan. 1857.	Feb. 1848.
Mean temperature of the coldest month	20.73	22.95	12.75	26.60
Difference between the temperatures of the warmest and the coldest months	49.70	44.09	——	——
Mean of deviations of monthly means from their respective averages of 27 years, signs of deviation being disregarded	2.51	2.35	3.62 in 1843.	1.38 in '64.
Months of greatest deviation, without regard to sign	August.	January.	Jan. 1857.	——
Corresponding magnitude of deviation	5.2	3.8	10.5	——
Warmest day	July 13.	——	July 12, '45.	July 31, '44.
Mean temperature of the warmest day	81.10	77.55	82.32	72.75
Coldest day	Jan. 7.	——	Feb. 6, '55 Jan. 22, '57	Dec. 22, 42.
Mean temperature of the coldest day	— 9.48	— 1.23	—14.38	9.57
Date of the highest temperature	July 13.	——	Aug. 24, '54.	Aug. 19, '40.
Highest temperature	94.0	90.7	99.2	82.4
Date of lowest temperature	Jan. 8.	——	Jan. 26, '59.	Jan. 2, '42.
Lowest temperature	—14.0	—12.3	—26.5	1.9
Range of the year	108.0	103.0	118.2	87.0

BAROMETER.

	1866.	Average of 26 years.	Extremes.	
Mean pressure of the year	29.6216	29.6175	29.6670 in 1849.	29.5602 in 1864.
Month of highest mean pressure	January.	Septemb'r	Jan. 1849.	June, 1864.
Highest mean monthly pressure	29.7184	29.6604	29.8046	29.6525
Month of lowest mean pressure	May.	June.	March, 1859.	Nov. 1849.
Lowest mean monthly pressure	29.4845	29.5699	29.4143	29.5886
		Average of 27 years.		
Date of highest pressure in the year	Jan. 8, 8 a.m.	——	Jan. 8, 1866.	Oct. 22, 1845.
Highest pressure	30.940	30.385	30.940	30.242
Date of lowest pressure in the year	Dec. 23, 11 p.m.	——	Mar. 19, 1859	Mar. 17, 1845.
Lowest pressure	28.807	28.687	28.286	28.939
Range of the year	2.133	1.69	2.133 in 1866.	1.303 in 1845.

RELATIVE HUMIDITY.

	1866.	Average of 20 years.	Extremes.	
Mean humidity of the year	75	78	82 in 1851.	73 in 1858.
Month of greatest humidity	January.	January.	Jan. 1857.	Dec. 1858.
Greatest mean monthly humidity	83	83	89	81
Month of least humidity	May.	May.	Feb. 1843.	April, 1849.
Least mean monthly humidity	62	72	58	76

EXTENT OF SKY CLOUDED.

	1866.	Average of 14 years.	Extremes.	
Mean cloudiness of the year	0.61	0.61	0.65	0.57
Most cloudy month	February.	Novemb'r.	—	—
Greatest monthly mean of cloudiness	0.82	0.74	0.83	0.73
Least cloudy month	July, Oct.	August.	—	—
Lowest monthly mean of cloudiness	0.50	0.47	0.30	0.50

WIND.

	1866.	Result of 19 years.	Extremes.	
Resultant direction	N 73° W	N 61° W	—	—
Mean resultant velocity in miles	2.83	1.89	—	—
Mean velocity, without regard to direction	7.41	6.89	8.55 in 1860.	5.10 in 1853.
Month of greatest mean velocity	March.	March.	March, 1860.	Jan. 1848.
Greatest monthly mean velocity	11.51	8.83	12.41	5.82
Month of least mean velocity	July.	July.	Aug. 1852.	Sept. 1860.
Least monthly mean velocity	4.17	4.95	3.30	5.79
Day of greatest mean velocity	March 25.	—	Mar. 19, 1859.	Dec. 2, 1848.
Greatest daily mean velocity	25.18	23.05	31.16	15.30
Day of least mean velocity	Sept. 29.	—	—	—
Least daily mean velocity	0.20	—	—	—
Hour of greatest absolute velocity	April 28, 8 to 9 p.m.	—	Dec. 27, '61, 9 to 10 a.m.	Mar. 14, '53, 11 a.m to n'n
Greatest velocity	38.5	40.02	46.0	25.6

RAIN.

	1866.	Average of 27 years.	Extremes.	
Total depth of rain in inches	34.209	29.983	43.555 in 1843.	21.505 in 1856.
Number of days in which rain fell	126	109	130 in 1861.	80 in 1841.
Month in which the greatest depth of rain fell	Septemb'r	Septemb'r	Sept. 1843.	Sept. 1848.
Greatest depth of rain in one month	5.657	3.755	9.760	3.115
Month in which days of rain were most frequent	July.	October.	Oct. 1864.	May, 1841.
Greatest number of rainy days in one month	16	13	22	11
Day in which the greatest amount of rain fell	July 17.	—	Sept. 14, '43.	Sept. 14, '48.
Greatest amount of rain in one day	2.345	2.083	3.455	1.00
Hour of heaviest rain	July 17, 4 to 5 p.m.	—	—	—
Greatest amount of rain in one hour	1.355	—	—	—

SNOW.

	1866.	Average of 27 years.	Extremes.	
Total depth in the year in inches	52.1	62.9	99.0 in 1855.	38.4 in 1851.
Number of days in which snow fell	69	59	87 in 1859.	33 in 1848.
Month in which the greatest depth of snow fell	February.	February.	Feb. 1846.	Dec. 1851.
Greatest depth of snow in one month	16.9	18.0	46.1	10.7
Month in which the days of snow were most frequent	January.	January. Decemb'r.	Dec. 1859. Jan 1861.	Feb. 1848.
Greatest number of days of snow in one month	19	13	23	8
Day in which the greatest amount of snow fell	Dec. 16.	—	Feb. 5, 1863.	Jan. 10, 1857.
Greatest fall of snow in one day	6.0	8.2	16.0	5.5

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—OCTOBER, 1866.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M.	10 PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 PM	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.826	29.769	29.695	29.7508	51.1	64.1	51.5	55.55	+ 5.13	.278	.372	.367	.349	74	62	96	80	N	SE b E	Calm.	S 88 E	3.4	1.2	0.0	0.54	0.75	...	...
2	.614	.470	.556	.5470	47.9	69.5	55.8	58.22	+ 8.28	.321	.547	.333	.400	96	76	74	80	Calm.	S W b S	N W b W	N 68 W	0.0	11.0	9.6	4.35	8.06	inap.	...
3	.696	.684	.739	.7117	43.5	52.6	41.7	46.00	— 3.53	.259	.188	.218	.219	92	47	82	72	N b W	N W	N W b N	N 14 W	5.5	3.5	3.8	6.44	6.66	...	...
4	.830	.928	30.060	.9543	36.0	47.2	38.1	40.90	— 8.13	.162	.155	.145	.150	76	47	63	59	N	E b S	N	N 26 E	6.4	2.0	4.0	3.04	3.47	...	...
5	30.178	30.180	30.105	30.1508	34.5	47.5	39.2	40.88	— 7.73	.126	.160	.180	.161	64	48	75	64	N N E	S E b S	Calm.	N 79 E	5.8	4.3	0.0	1.50	3.10	...	...
6	30.068	29.979	29.930	29.9888	36.7	56.2	45.0	46.93	— 1.28	.197	.241	.230	.236	90	53	77	74	N N E	S	Calm.	S 21 E	2.5	3.0	0.0	0.73	1.10	...	...
7	29.860	.780	—	—	47.2	61.9	—	—	—	.279	.464	—	—	86	84	—	—	Calm.	S W b S	Calm.	S 34 W	0.0	8.5	0.0	2.36	2.37	...	...
8	.719	.666	.663	.6822	51.5	70.2	55.1	59.53	+12.08	.367	.523	.398	.439	96	71	91	87	S W b W	S S W	Calm.	S 17 W	0.5	5.4	0.0	0.81	1.15	...	...
9	.674	.648	.668	.6577	54.7	57.6	64.0	55.55	+ 8.48	.414	.410	.390	.411	97	86	93	93	N E	E N E	E b N	N 76 E	6.0	9.6	5.2	8.99	9.05	.895	...
10	.642	.674	.709	.6800	54.4	56.2	55.5	55 35	+ 8.68	.396	.371	.381	.383	93	82	86	87	E b N	E b N	E N E	N 73 E	11.0	13.0	7.0	9.37	9.45	.015	...
11	.721	.703	.698	.7035	53.6	58.0	54.0	54.85	+ 8.60	.362	.359	.335	.346	87	74	80	80	E N E	E b N	N E b N	N 57 E	1.2	8.3	4.2	3.75	4.08	...	...
12	.684	.674	.687	.6835	50.0	58.3	52.6	53.68	+ 7.72	.283	.235	.249	.266	78	48	62	65	N N E	E b S	N E b E	N 40 E	2.2	5.0	0.6	2.87	3.84	...	...
13	.744	.738	.794	.7607	50.4	56.2	49.0	51.75	+ 6.18	.282	.316	.287	.293	77	70	82	77	N b E	S	N	N 6 W	6.8	3.6	8.5	3.95	5.11	...	...
14	.893	.936	—	—	43.5	56.5	—	—	—	.205	.281	—	—	72	62	—	—	N b W	S b W	N b W	N 4 W	6.0	0.8	9.0	6.20	6.92	...	...
15	30.082	30.050	30.074	30.0708	45.4	65.5	53.6	55.32	+10.47	.253	.226	.266	.245	83	35	65	59	N b W	N b W	N	N 13 W	8.5	9.2	9.4	7.76	7.86	...	...
16	30.028	29.945	29.832	29.9235	51.8	62.7	50.0	55.08	+10.55	.270	.353	.274	.297	70	62	75	68	N	S W b S	Calm.	N 50 W	9.8	4.0	0.0	1.13	2.17	...	...
17	29.776	.684	.702	.7152	45.7	65.6	51.5	54.42	+10.18	.249	.428	.336	.337	81	67	88	79	Calm.	S S W	Calm.	S 59 W	0.0	0.4	0.0	0.62	0.77	...	...
18	.746	.717	.694	.7160	47.5	64.1	49.0	53.17	+ 9.13	.294	.386	.297	.312	89	64	85	76	Calm.	S b W	Calm.	S 40 E	0.0	2.8	0.0	0.54	0.80	...	...
19	.668	.616	.734	6775	44.3	64.1	54.4	54.75	+10.97	.278	.410	.298	.341	95	68	69	79	Calm.	S S W	Calm.	S 54 W	0.0	8.6	0.0	1.41	3.95	.160	...
20	.809	.752	.689	.7483	49.7	58.7	53.6	54.30	+10.73	.317	.396	.362	.365	89	80	87	86	N E b N	E	Calm.	N 71 E	2.8	3.0	0.0	2.28	2.35	...	...
21	.612	.488	—	.—	55.1	64.1	—	—	—	.375	.473	—	—	86	78	—	—	E b N	S b E	S S W	S 8 W	0.3	7.0	1.0	5.85	6.05	.150	...
22	.098	.345	.430	.3047	61.2	58.9	49.7	55.90	+12.93	.387	.116	.169	.221	71	22	47	47	S b W	S W	S W b W	S 45 W	15.8	23.4	6.4	14.64	14.75	inap.	...
23	.407	.379	.461	.4160	45.0	50.4	38.8	44.50	+ 1.75	.166	.160	.170	.160	55	43	71	55	S W	S W b W	W b S	S 63 W	9.0	12.0	2.8	9.50	9.74	...	...
24	.493	.563	.703	.6012	32.7	43.5	35.6	37.10	— 5.40	.172	.168	.159	.165	92	59	76	75	W S W	N W	W N W	N 49 W	3.8	19.2	8.6	9.07	9.36	...	...
25	.819	.840	.826	.8300	33.1	39.2	36.3	36.33	— 5.95	.145	.131	.185	.142	76	54	86	66	Calm.	S E	E	S 79 E	0.0	4.8	6.8	4.36	4.82	.095	...
26	.672	.528	.532	.5750	38.5	42.5	42.1	40.77	— 1.22	.208	.244	.249	.231	89	89	93	90	E	S E b S	Calm.	S 20 E	10.0	10.2	0.0	3 37	4.40	.320	...
27	.622	.792	.913	.7928	39.6	42.1	37.4	40.12	— 1 67	.227	.170	.162	.190	94	62	72	76	S W b W	N N W	Calm.	N 24 W	1.6	13.5	0.0	3.44	5.75	...	...
28	.922	.718	—	—	37.4	44.6	—	—	—	.162	.226	—	—	72	77	—	—	E N E	E b S	E	S 89 E	9.4	13.4	9.0	10.50	10.77	.360	...
29	.485	.406	.350	.4063	49.7	50.8	44.6	48.18	+ 6.92	.338	.361	.264	.319	95	97	90	94	S b E	S b W	N b W	N 62 W	5.0	1.8	14.5	4.01	7.39	.475	...
30	.338	.301	.306	.3410	42.8	47.2	37.4	41.85	+ 0.90	.223	.249	.197	.219	81	76	87	82	W b S	W N W	W N W	S 89 W	7.0	0.5	1.2	6.17	6.37	inap.	...
31	.538	.671	.767	.6752	33.1	36.7	33.4	34.47	— 6.28	.153	.096	.141	.131	81	43	74	66	W	N W b W	S W b W	N 75 W	7.6	19.8	2.0	8.13	8.90		inap.
M	29.7029	29.6927	29.7154	29.7061	45.35	55.02	46.63	49 09	+ 4.05	.264	.288	.261	.272	84	62	79	75	....	....	....	....				... ...	5 53	2.470	inap.

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR OCTOBER, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . . . 30.210 at 8 a.m. on 5th. } Monthly range=
Lowest Barometer . . . . . . 29.082 at 7 a.m. on 22nd. } 1.128 inches.

Self-registering Ther. { Maximum Temperature . . . . . 71°.0 on 2nd and 8th. } Monthly range=
Minimum Temperature . . . . . 31°.8 on 24th. } 39°.2
Mean Maximum Temperature . . 57°56 } Mean daily range=13°73
Mean Minimum Temperature . . 43°83 }
Greatest daily range . . . . 24°8 from a.m. to p.m. of 2nd.
Least daily range . . . . 3°6 from a.m. to p.m. of 10th.

Warmest day . . . . 8th ...Mean Temperature . . . 59°53 } Difference=25°.06
Coldest day . . . . . 31st...Mean Temperature . . . 34°47 }

Maximum { Solar . . . . 116°.0 on 8th } Monthly range=
Radiation. { Terrestrial . . . . 20°.0 on 24th } 96°.0

Aurora observed on 8 nights, viz.—3rd, 4th, 5th, 9th, 11th, 13th, 30th, and 31st.
Possible to see Aurora on 22 nights; impossible on 9 nights.
Snowing on 1 day; depth inapp.; duration of fall 0.2 hours.
Raining on 11 days; depth 2.470 inches; duration of fall 59.5 hours.
Mean of cloudiness=0.50; most cloudy hour observed, 4 p.m.; mean=0.57; least cloudy hour observed, 12 p.m.; mean=0.43.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1536.50	996.68	1159.68	1477.42

Resultant Direction, N. 30° W.; Resultant Velocity, 0.84 miles per hour.
Mean Velocity, 5.53 miles per hour.
Maximum Velocity, 25.4 miles, from 7 to 8 a.m. of 22nd.

Most windy day, 22nd—Mean velocity 14.75 miles per hour. } Difference,
Least windy day, 1st —Mean velocity 0.75 miles per hour. } 14.00 miles

Most windy hour, 9 a.m.—Mean velocity 7.80 miles per hour. } Difference,
Least windy hour, 10 p.m.—Mean velocity 3.43 miles per hour. } 4.37 miles

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Fog recorded on the 1, 2, 7, 8, 9, 17, 18, 19, and 29th days.—Thunder storm on 9th.—Solar halo on 11th.—Rainbow, a.m. of 21st.—Rainbow, a.m. of 22nd.

October, 1866, was very warm. The mean temperature showing an excess above the average never before reached except in October, 1854.

COMPARATIVE TABLE FOR OCTOBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum observed.	Minimum observed.	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	44.4°	— 1.2°	68.5°	23.9°	44.6°	13	1.860	3	...	...	...	...
1841	41.6	— 4.0	58.3	20.3	38.0	6	1.360	2	...	...	...	0.41 lbs
1842	45.1	— 0.5	68.5	30.0	38.5	8	5.175	0	...	...	...	0.35 "
1843	41.8	— 3.8	65.7	24.5	41.2	12	3.790	4	2.5	...	...	0.54 "
1844	43.3	— 2.3	69.6	17.8	51.8	7	Imp	4	12.0	...	...	0.43 "
1845	46.4	+ 0.8	62.7	20.0	42.7	11	1.760	1	Inp.	...	...	0.26 "
1846	44.6	— 1.0	69.7	20.7	49.0	14	4.180	2	Inp.	...	...	0.44 "
1847	44.0	— 1.6	65.0	20.3	44.7	13	4.390	2	Inp.	...	...	0.19 "
1848	46.3	+ 0.7	62.2	26.4	35.8	11	1.550	0	...	N 54 W	1.24	4.60 ms
1849	45.3	— 0.3	59.2	25.5	33.7	13	5.965	1	Inp.	N 12 W	1.27	7.76 "
1850	45.4	— 0.2	66.6	24.8	41.8	10	2.085	0	...	N 66 W	1.10	5.30 "
1851	47.4	+ 1.8	66.1	25.0	41.1	10	1.680	2	0.3	S 72 W	1.06	4.39 "
1852	48.0	+ 2.4	70.7	29.8	40.9	12	5.280	0	...	N 5 E	1.19	4.47 "
1853	44.4	— 1.2	64.7	25.5	39.2	10	0.875	2	Inp.	S 88 W	1.74	4.77 "
1854	49.5	+ 3.9	74.2	29.8	44.4	15	1.495	3	Inp.	N 45 W	1.52	4.57 "
1855	45.4	— 0.2	64.3	28.0	36.3	14	2.485	5	0.8	N 82 W	4.91	9.88 "
1856	45.3	— 0.3	70.1	23.3	46.8	10	0.875	2	0.1	N 76 W	2.15	6.07 "
1857	45.4	— 0.2	63.5	27.7	35.8	10	1.040	2	0.2	N 19 W	2.93	6.24 "
1858	48.8	+ 3.2	76.3	34.2	42.1	17	1.797	1	Inp.	N 34 W	0.36	5.96 "
1859	43.0	— 2.6	68.4	22.3	46.1	11	0.940	4	Inp.	N 68 W	5.04	8.12 "
1860	47.3	+ 1.7	63.7	28.4	35.3	15	1.618	1	Inp.	N 9 W	2.00	6.93 "
1861	48.7	+ 3.1	64.5	30.2	34.3	15	1.993	1	Inp.	N 61 W	1.06	5.96 "
1862	48.7	+ 3.1	76.0	27.0	49.0	19	2.684	2	0.5	N 78 W	2.89	6.53 "
1863	45.9	+ 0.3	63.4	30.9	32.5	16	2.522	0	...	S 71 W	0.48	6.16 "
1864	45.2	— 0.4	64.8	28.4	36.4	22	3.321	1	Inp.	N 60 W	3.17	6.66 "
1865	44.5	— 1.1	66.6	22.3	44.3	17	2.705	3	4.5	N 36 W	3.55	7.26 "
1866	49.1	+ 3.4	70.2	32.7	37.5	11	2.470	1	Inp.	N 30 W	0.84	5.53 "
Results to 1864.	45.65	...	66.67	25.79	40.88	12.6	2.530	1.8	0.78	N 60 W	1.74	6.14
Exc. for 1866.	+3.44	...	+3.53	+6.91	—3.38	— 1.6	—060	— 0.8	— 0.78	...	...	— 0.61

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—NOVEMBER, 1866.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 P.M	10 P.M.	Re-sul't.	ME'N		
					°	°	°	°	°												°							
1	29.691	29 488	29.355	29.4992	37.1	44.6	46.8	43.30	+ 2.83	.166	.200	.216	.195	75	67	67	68	S W	S S W	S S W	S 50 W	2.2	18.0	10.8	10.83	14.15	inap.	...
2	.566	.714	.838	.7343	38.1	41.4	35.3	37.30	— 2.97	.204	.152	.164	.161	88	58	80	73	W N W	W N W	NW b W	N 75 W	12.8	0.5	8.4	5.52	5.76	...	...
3	.924	.925	.994	.9547	30.9	39.2	31.3	34.03	— 5.97	.157	.138	.129	.146	90	57	73	75	Calm.	W S W	W	N 82 W	0.0	7.8	1.4	3.08	3.51	...	inap.
4	30.079	30.165	—	—	32.7	34.5	—	—	—	.143	.114	.—	—	76	57	—	—	N E b N	N	N	N 1 E	3.0	10.0	4.8	4.50	4.59	...	...
5	30.334	30.321	30.304	30.3192	23.3	34.5	27.3	28.62	—10.87	.110	.114	.126	.117	88	58	84	76	N N E	W N W	NW b W	N 24 W	1.0	3.0	0.5	1.41	1.58	...	...
6	30.248	30.124	30.041	30.1307	23.3	42.1	33.8	33.85	— 5.32	.110	.151	.144	.140	87	56	75	73	Calm.	S S W	S W b S	S 35 W	0.0	7.0	2.6	2.65	2.70	...	...
7	29.966	29.828	29 770	29.8473	34.2	50.4	38.5	39.88	+ 0.88	.160	.177	.156	.163	81	48	66	67	S W	S W b S	W S W	S 44 W	5.0	9.2	2.2	3.82	4.00	...	...
8	.726	.650	.694	.6890	32.0	54.0	45.0	43.58	+ 4.90	.166	.241	.230	.219	91	57	77	77	Calm.	S S W	Calm.	S 61 W	0.0	8.0	0.0	3.76	3.95	...	...
9	.716	.665	.661	.6803	37.0	50.4	41.4	43.67	+ 5.27	.176	.288	.241	.236	79	78	92	82	Calm.	S b W	S W	S 52 W	0.0	10.6	2.5	4.33	5.88	...	...
10	.745	.718	.601	.6753	35.6	47.5	43.9	42.15	+ 4.07	.186	.216	.226	.209	89	65	79	78	NW b W	S b E	E N E	S 85 E	5.8	4.8	7.5	4.91	7.01	.230	...
11	.291	.361	—	—	46.4	49.0	—	—	—	.290	.265	.—	—	92	76	—	—	E S E	SW b W	S W	S 38 W	16.0	19.0	5.8	9.04	10.93	inap.	...
12	.688	.782	.933	.8193	34.2	44.3	37.4	38.70	+ 1.20	.171	.157	.162	.167	86	53	72	72	Calm.	W b N	N W	N 77 W	0.0	11.6	9.0	5.12	5.82	...	...
13	30.009	30.002	.922	.9750	31.3	42.5	41.4	38.80	+ 1.62	.144	.199	.214	.185	81	73	81	77	N b W	E S E	E	S 83 E	2.0	7.0	5.6	5.17	5.52	...	...
14	29.810	29.661	.651	.7023	42.5	47.5	46.8	45.25	+ 8.35	.263	.207	.295	.244	97	62	92	81	E	E b S	S S W	S 51 E	8.8	11.0	7.8	5.17	6.44	.275	...
15	.511	.193	28.966	.1922	42.8	44.3	42.8	43.17	+ 6.67	.250	.283	.250	.259	90	97	90	92	S E B S	E	N W	N 60 W	4.0	3.5	13.0	4.61	7.69	.875	...
16	28.865	28.901	29.100	28.9707	37.8	37.6	39.9	38.27	+ 2.07	.208	.202	.190	.198	91	89	77	85	W	W b S	W	S 83 W	21.5	26.0	12.0	14.98	15.12	.465	...
17	29.296	29.434	.493	29.4173	36.3	42.5	39.6	39.33	+ 3.53	.168	.173	.194	.180	78	63	79	75	W	W b N	S W	S 67 W	8.0	10.2	7.5	7.60	8.17	.023	...
18	.444	.516	—	—	41.0	45.7	—	—	—	.218	.221	.—	—	85	72	—	—	W S W	W b S	Calm.	S 53 W	8.5	2.0	0.0	2.64	3.46	·080	...
19	.446	.254	.121	.2598	42.5	43.5	45.7	43.90	+ 8.82	.253	.259	.259	.255	93	92	84	89	S E B S	E b N	S	S 83 E	3.1	6.0	11.4	4.50	6.75	.320	...
20	.089	.208	.398	.2507	42.5	39.9	37.4	39.70	+ 4.93	.263	.198	.196	.216	97	80	88	88	N W	NW b N	NW b N	N 45 W	16.8	23.0	13.5	17.86	18.29	.055	...
21	.448	.487	.582	.5143	33.8	32 7	29.8	31.92	— 2.47	.173	.157	.147	.146	89	85	88	80	N W	NW b N	NW b N	N 48 W	13.0	13.5	3.5	8.94	9.96	...	...
22	.490	.388	.509	.4687	27.0	28 4	28.0	27.50	— 6.58	.121	.134	.139	.129	82	86	90	86	N E	N E	N N E	N 31 E	6.8	12.8	3.8	8.98	9.91	...	2.0
23	.622	.654	.706	.6717	25.5	32.0	27.0	27.43	— 6.23	.125	.143	.129	.130	91	79	88	87	N N W	NW b N	W N W	N 44 W	10.4	1.6	4.2	3.98	4.71	...	...
24	.698	.626	.658	.6660	27.0	30.7	27.3	28.00	— 5.27	.129	.151	.103	.126	88	88	69	82	W	W	W N W	N 78 W	7.0	2.5	16.5	7.78	9.22	...	0 2
25	.848	.894	—	—	21.9	28.8	—	—	—	.099	.129	.—	—	84	81	—	—	N b W	Calm.	S b E	S 20 W	0.8	0.0	4.0	2.07	2.42	...	...
26	.774	.710	.748	.7437	33.8	41 4	40.7	37.90	+ 5.33	.166	.195	.204	.189	85	75	80	82	S W	S S W	S S W	S 28 W	3.6	6.6	1.0	3.17	3.21	...	...
27	.734	.650	.538	.6320	41.0	46.1	45.7	44.10	+11.92	.227	.216	.259	.236	88	69	84	82	S S W	S E	S E b E	S 44 E	1.2	4.8	2.0	2.84	3.28	.060	...
28	.476	.284	.328	.3583	46.1	50.0	49.0	48 25	+16.37	.292	.345	.337	.324	94	96	97	96	S E b E	S	S W b S	S 12 E	2.2	3.0	0.5	1.19	2.78	.520	...
29	.310	.343	.343	.3345	45.7	44.3	41.7	43.62	+12.12	.298	.268	.237	.262	97	92	89	92	N	NW b N	N W	N 57 W	5.5	7.5	6.4	4.29	5.05	.060	...
30	.302	.334	.536	.4117	37.1	37.4	33.4	35.25	+ 4.17	.174	.126	.163	.154	78	56	85	74	W b S	W S W	NW b W	N 86 W	11.5	18.4	18.6	15.49	16.91	...	inap.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.6340	29.5902	29.6073	29.6122	35.32	41.89	38.34	38.36	+ 2.21	.187	.196	.197	192	87	72	82	80	....	....	....	....	6.02	8.96	6.23	......	6.96	2.963	2.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR NOVEMBER, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer ....30.372 at 10 a.m. on 5th } Monthly range =
Lowest Barometer ....28.855 at 8 a.m. on 16th } 1.517 inches.

Self-registering Thermom.
Maximum Temperature ....54°2 on 8th } Monthly range =
Minimum Temperature ....21°8 on 25th } 32°4
Mean maximum Temperature ....43°83 } Mean daily range =
Mean minimum Temperature ....33°17 } 10°66
Greatest daily range......24°2 from a.m. to p.m. of 8th.
Least daily range .... 2°2 from a.m. to p.m. of 20th.

Warmest day.........28th...Mean temperature...............48°25 } Difference = 20°82
Coldest day......... . 23rd ...Mean temperature...............27°43 }

Maximum Radiation. { Solar .... 93°5 on 7th } Monthly range =
{ Terrestrial .... 11°0 on 6th } 82°5

Aurora observed on 2 nights, viz:—2nd and 3rd.
Possible to see Aurora on 11 nights; Impossible on 19 nights.
Snowing on 4 days; depth 2.2 inches; duration of fall 18.6 hours.
Raining on 13 days; depth 2.963 inches; duration of fall 81.7 hours.
Mean of cloudiness = 0.72.
Most cloudy hour observed, 4 p.m.; mean = 0.80; least cloudy hour observed, 6 a.m.; mean = 0.65.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1341.20	1277.83	764.86	2974.09

Resultant direction N. 83° W.; Resultant velocity 3.06 miles per hour.
Mean velocity...................................6.96 miles per hour.
Maximum velocity..........................30.0 miles, from 1 to 2 p.m. of 16th.
Most windy day.........20th......... Mean velocity, 18.29 miles per hour. } Difference =
Least windy day......... 5th......... Mean velocity, 1.58 ditto } 16.71 miles.
Most windy hour ......11 a.m.........Mean velocity, 9.61 ditto } Difference =
Least windy hour...... 7 a.m ....Mean velocity, 5.68 ditto } 5.93 miles.

26th. Solar halo during forenoon, Lunar halo a.m.
27th. Morning foggy, Solar halo 1 p.m.

COMPARATIVE TABLE FOR NOVEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max. ob-served.	Min. ob-served.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	35.9	— 0.8	54.4	20.5	33.9	5	1.220	8	...	...	...	....
1841	35.0	— 1.7	63.2	7.6	55.6	8	2.450	5	...	...	...	0.91 lbs.
1842	33.3	— 3.4	50.6	7.6	43.0	9	5.310	10	...	...	...	1.22
1843	33.5	— 3.2	51.2	14.4	26.8	10	4.765	7	1.2	...	...	0.59
1844	34.9	— 1.8	49.8	12.0	37.8	8	imp.	4	8.0	...	...	0.48
1845	26.8	+ 0.1	58.8	7.6	51.2	7	1.105	4	5.0	...	...	0.53
1846	41.3	+ 4.6	55.5	18.2	37.3	12	5.805	2	0.4	...	...	0.64
1847	38.6	+ 1.9	58.2	7.8	50.4	14	3.155	3	inap.	...	...	0.36
1848	34.5	— 2.2	49.3	16.5	32.8	9	2.020	3	1.4	N 81° W	1.81	4.81mls.
1849	42.6	+ 5.9	56.7	28.4	28.3	10	2.815	2	1.0	N 39° W	1.55	4.78
1850	38.8	+ 2.1	62.3	18.1	44.2	7	2.955	1	inap.	N 42° W	1.43	5.27
1851	32.9	— 3.8	50.1	16.5	33.6	5	3.885	6	6.7	N 50° W	1.25	4.70
1852	36.0	— 0.7	50.4	18.7	31.7	7	1.775	3	2.0	N 59° W	1.53	6.50
1853	38.7	+ 2.0	54.1	14.4	39.7	15	2.425	6	2.7	N 9° W	0.55	5.52
1854	36.8	+ 0.1	54.9	15.1	39.8	13	1.115	4	1.3	W	3.44	7.54
1855	38.6	+ 1.9	54.1	18.7	35.4	8	4.590	6	3.0	N 66° W	3.18	10.81
1856	37.4	+ 0.7	56.4	22.8	33.6	10	1.375	9	9.5	S 85° W	2.95	8.75
1857	33.5	— 3.2	57.8	—2.3	60.1	14	3.235	9	6.9	S 61° W	5.45	9.25
1858	34.2	— 2.5	52.0	20.5	31.5	12	3.879	13	4.0	N 25° W	3.14	8.87
1859	38.9	+ 2.2	61.0	24.1	36.9	12	5.193	9	0.6	N 81° W	3.39	9.65
1860	37.9	+ 1.2	62.7	14.0	48.7	12	2.569	8	1.9	S 89° W	4.95	11.02
1861	37.1	+ 0.4	51.5	25.1	26.4	14	4.294	8	3.2	N 46° W	1.94	7.44
1862	35.6	— 1.1	58.0	17.2	40.8	11	2.205	11	5.3	N 46° W	3 00	6.60
1863	39.1	+ 2.4	57.6	19.4	38.2	13	3.656	6	0.1	N 88° W	3.50	7.86
1864	36.9	+ 0.2	56.5	21.9	34.6	11	3.765	8	4.5	S 72° W	3.82	7.64
1865	38.6	+ 1.9	55.8	24.4	31.4	5	0.975	7	1.1	N 79° W	2.98	7.90
1866	38.4	+ 1.7	54.0	21.9	32.1	13	2.963	4	2.2	N 88° W	3.06	6.96
Results to 1864.	36.75	...	55.48	16.19	39.29	10.2	3.148	6.2	3.12	N 78° W	2.43	7.47
Excess for 1866.	+ 1.61	...	— 1.48	+ 5.71	— 6.19	+ 2.8	— 0.185	— 2.2	— 0.92	....	...	— 0.51

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—DECEMBER, 1866.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17.33 *min. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A. M.	2 P. M.	10 P.M.	Result'.	ME'N		
1	29.756	29.786	29.816	29.7910	26.2°	31.3°	30.2°	28.82°	— 1.97°	.116	.110	.136	.117	82	62	80	73	N W b W	N W	W	N 64° W	21.0	8,5	9.0	7.02	7.95	...	...
2	.813	.796	—	—	27.7	37.0	—	—	—	.142	.167	—	—	94	75	—	—	W b S	S W b S	Calm.	S 22 W	0.8	12.6	0.0	4.55	4.83	...	...
3	.748	.638	.477	.6123	34.9	41.0	40.3	38.62	+ 8.53	.161	.141	.158	.152	79	54	63	65	S E b S	E b S	E S E	S 58 E	5.4	8.0	3.8	5.61	6.34	.200	...
4	.322	.203	.496	.3568	39.6	41.4	38.5	40.00	+10.22	.227	.232	.208	.222	94	89	89	90	E b S	W b S	S W b W	S 62 W	5.2	6.3	3.8	5.30	7.57	.420	...
5	.737	.836	.926	.8468	34.2	43.5	33.1	36.40	+ 7.03	.177	.214	.167	.181	89	75	88	84	S W b W	S S W	S W b S	S 75 W	5.6	2.0	0.6	2.83	3.54	...	...
6	.891	.720	.635	.7410	36.3	40.7	39.6	39.17	+10.10	.202	.231	.232	.220	94	91	96	92	N E	E N E	Calm.	N 71 E	2.6	8.5	0.0	2.87	4.31	.035	...
7	.649	.626	.526	.5935	40.3	47.5	36.3	41.15	+12.48	.228	.235	.185	.219	91	71	86	85	W b S	S S W	Calm.	S 3 W	2.0	4.5	0.0	3.46	6.53	.045	...
8	.193	28.974	.129	.0952	41.4	50.4	42.1	43.20	+14.72	.259	.199	.178	.207	99	52	66	74	E	S W	S W b W	S 48 W	10.5	28.8	22.0	14.29	18.18	1.120	0.1
9	.368	29.298	—	—	29.1	32.7	—	—	—	.141	.172	—	—	87	92	—	—	W b S	W S W	W b S	S 71 W	14.0	10.6	20.9	16.45	16.68	...	...
10	.411	.484	.555	.4922	15.8	20.3	17.2	17.55	—10.30	.078	.051	.068	.065	88	45	72	68	W S W	W	W S W	S 73 W	19.0	24.6	14.4	15.95	16.06	...	...
11	.578	.546	.599	.5763	17.9	24.8	16.8	19.30	— 8.35	.085	.063	.073	.077	87	46	78	74	W S W	S W b W	W b S	S 72 W	13.3	12.0	12.2	11.81	11.83	...	...
12	.611	.663	.734	.6785	16.1	21.5	15.8	17.57	— 9.78	.074	.056	.064	.064	83	47	74	68	W S W	W b S	W b S	S 73 W	8.6	19.8	8.8	14.70	14.74	...	...
13	.761	.728	.791	.7712	17.2	23.7	15.8	17.88	— 9.27	.075	.076	.069	.073	78	59	77	74	W b S	W N W	N	N 54 W	15.0	16.2	8.4	9.93	12.81	...	inap.
14	.978	30.103	30.134	30.0812	7.5	13.2	8.9	9.65	—17.32	.054	.054	.055	.054	88	67	84	80	N b W	N W b N	N	N 20 W	12.0	9.0	9.6	7.51	7.58	..	...
15	30.139	30.036	29.925	30.0267	5.7	17.9	16.1	13.90	—12.87	.047	.055	.062	.060	83	55	68	71	N	N	N E	N 50 E	8.8	1.0	9.2	6.38	6.88	...	...
16	29.639	29.368	—	—	15.1	27.3	—	—	—	.074	.133	—	—	86	89	—	—	N E b E	E b N	N E	N 64 E	20.6	13.5	11.5	12.40	14.20	...	6.0
17	.325	.465	.676	29.5115	19.4	22.6	26.2	22.98	— 3.38	.100	.104	.124	.109	96	86	87	88	N b W	N W b W	N W b W	N 54 W	8.5	8.5	15.3	7.10	7.30	...	0.5
18	29.799	.761	.693	.7447	17.6	28.8	30.2	26.12	— 0.05	.083	.108	.142	.112	85	68	84	78	Calm.	S W b W	S W	S 50 W	0.0	2.6	16.5	8.21	8.35	...	...
19	.648	.605	.870	.7233	29.8	33.1	14.7	25.08	— 0.98	.133	.167	.067	.121	80	88	78	83	S W b W	S W	N b W	N 18 W	2.2	1.0	10.0	8.15	11.03	...	2.0
20	30.179	30.302	30.281	30.2605	—2.8	7.5	3.5	1.88	—24.00	.036	.054	.040	.039	93	88	75	80	N b E	N b E	N N E	N 21 E	15.3	3.8	10.5	6.85	7.65	...	1.0
21	30.210	30.029	29.853	30.0067	12.9	20.5	22.6	19.22	— 6.57	.069	.074	.085	.079	89	67	70	75	S E	E S E	S b W	S 33 E	6.4	8.0	7.0	6.37	7.53	...	...
22	29.743	29.555	.419	29.5572	29.8	35.3	36.3	34.15	+ 8.47	.140	.146	.185	.159	84	71	86	80	Calm.	S	S E b S	S 21 E	0.0	9.0	6.5	6.12	6.48	.130	inap.
23	.182	28.984	—	—	37.8	39.6	—	—	—	.217	.237	—	—	96	97	—	—	S S E	S S E	N W	S 76 W	3.5	0.8	11.0	3.36	5.34	.840	...
24	.036	29.083	.207	.1227	35.6	35.8	31.6	34.13	+ 8.65	.202	.199	.170	.184	97	95	96	93	S W	S W	W b S	S 64 W	6.2	7.6	10.5	6.20	6.55	...	0.3
25	.299	.400	—	—	28.4	26.6	—	—	—	.134	.112	—	—	86	77	—	—	W	W S W	S W	S 69 W	9.5	9.8	11.4	11.14	11.44	...	0.1
26	.577	.411	.283	.4155	21.2	31.3	30.6	26.97	— 1.67	.107	.152	.160	.135	94	86	93	91	W b S	S S W	Calm.	S 69 W	0.5	7.2	0.0	4.30	8.18	...	5.0
27	.228	.287	.390	.3118	23.3	23.3	16.1	19.83	— 5.45	.110	.095	.062	.083	87	75	68	75	N W b W	N W	W N W	N 61 W	10.8	29.0	27.0	24.86	25.05	...	...
28	.374	.368	.515	.4275	11.8	19.7	17.2	16.42	— 8.73	.052	.071	.075	.067	70	66	78	72	W N W	W N W	W N W	N 68 W	29.0	27.0	23.0	24.40	24.51	...	...
29	.629	.653	.705	.6760	13.6	21.2	16.5	16.20	— 8.97	.072	.079	.076	.071	90	70	83	78	W N W	W S W	W S W	W	17.0	10.5	14.2	9.62	10.41	...	0.4
30	.788	.869	—	—	13.2	18.3	—	—	—	.071	.068	—	—	90	68	—	—	Calm.	S W	N	S 38 W	0.0	6.5	1.2	2.86	4.75	...	0.1
31	.792	.716	.760	.7543	20.1	24.1	18.3	20.63	— 4.55	.091	.093	.080	.087	85	72	81	79	S E b S	Calm.	Calm.	S 4 E	7.0	0.0	0.0	1.87	2.56	...	...
M	29.6526	29.6231	29.6558	29.6470	22.62	28.82	24.58	25.06	— 2.03	.119	.122	.117	.118	88	70	80	79	....	....	....	....	9 04	10.23	9.64	......	9.91	2.790	15.5

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR DECEMBER, 1866.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 6 A. M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 30.313 at 10 a.m. on 20th. } Monthly range=
Lowest Barometer . . . . 28.807 at 11 p.m. on 23rd } 1.506 inches.

Self-registering Ther.
Maximum temperature . . . 51°.0 on 8th. } Monthly range=
Minimum temperature . . . 5°.0 on 20th. } 56°0
Mean maximum temperature . . 31°20 } Mean daily range=11°16
Mean minimum temperature . . 20°04 }
Greatest daily range . . . . 33°8 from a.m. to p.m. of 21st.
Least daily range . . . . 2°6 from a.m. to p.m. of 24th.

Warmest day . . . . 8th...Mean Temperature . . . 43°20 } Difference=41°.32
Coldest day . . . . . 20th ..Mean Temperature . . . 1°88 }

Maximum } Solar . . . . 87°5 on 7th } Monthly range=
Radiation } Terrestrial . . . . —10°0 on 20th } 97°.5

Aurora observed on 1 night, viz.:—on 2nd.
Possible to see Aurora on 18 nights; impossible on 13 nights.
Snowing on 13 days; depth 15.5 inches; duration of fall 59.7 hours.
Raining on 7 days; depth 2.790 inches; duration of fall, 46.2 hours.
Mean of cloudiness=0.63; Most cloudy hour observed, 2 p.m; mean=0.72; least cloudy hour observed, 6 a.m.; mean=0.53.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1812.15	1942.59	977.79	4683.10

Resultant direction, S. 83° W.; Resultant Velocity, 4.98 miles per hour.
Mean velocity 9.91 miles per hour.
Maximum velocity 33.7 miles, from 8 to 9 p.m. of 27th.
Most windy day 27th—Mean velocity 25.05 miles per hour. } Difference 23.18.
Least windy day 31st—Mean velocity 1.87 miles per hour. }
Most windy hour, noon. —Mean velocity, 11.53 miles per hour. } Difference
Least windy hour, 6 a.m.—Mean velocity, 8.86 miles per hour. } 2.67 miles.

3rd, Solar halo at noon.—7th. Ground fog.—15th, Lunar halo.—16th, Very stormy, snow and drift.—21. Lunar corona —23. Stormy day, very dense fog during the day.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	24.3°	— 1.9	41.0°	— 4.4°	45.4°	3	Inap.	18	...	...	...	...
1841	28.7	+ 2.5	45.5	2.4	43.1	7	6.600	5	...	...	...	1.33 lbs
1842	24.7	— 1.5	40.3	3.8	36.5	3	0.880	17	...	...	...	0.61 "
1843	30.0	+ 3.8	41.1	2.7	38.4	6	1.040	8	8.1	...	...	0.53 "
1844	28.2	+ 2.0	48.9	— 0.8	49.7	6	Imp.	6	4.2	...	...	0.40 "
1845	21.1	— 5.1	37.6	— 2.7	40.3	2	Inap.	12	4.7	...	...	0.70 "
1846	27.5	+ 1.3	49.2	3.7	45.5	5	1.215	9	6.0	...	...	0.57 "
1847	30.1	+ 3.9	50.0	6.6	43.4	7	1.185	8	6.8	...	...	0.35 "
1848	29.1	+ 2.9	49.1	0.6	48.5	7	2.750	7	16.5	S 83 W	1.12	5.44 ms
1849	26.5	+ 0.3	41.3	— 5.2	46.5	5	0.840	12	9.6	N 82 W	2.56	6.23 "
1850	21.7	— 4.5	48.3	— 9.7	58.0	2	0.190	18	29.5	N 44 W	2.93	7.40 "
1851	21.5	— 4.7	43.8	—10.5	54.3	6	1.075	15	10.7	N 82 W	4.00	7.37 "
1852	31.9	+ 5.7	51.0	13.9	37.1	7	3.995	10	20.1	S 69 W	1.03	6.54 "
1853	25.3	— 0.9	42.2	— 5.2	47.4	4	0.625	13	22.3	N 35 W	2.39	4.98 "
1854	21.9	— 4.3	41.8	— 5.9	47.7	5	0.590	12	17.2	N 44 W	4.30	8.56 "
1855	26.8	+ 0.6	45.9	— 2.1	48.0	6	1.845	10	29.5	S 88 W	5.29	11.38 "
1856	22.9	— 3.3	41.2	— 9.1	50.3	6	1.790	20	16.3	S 87 W	4.62	11.56 "
1857	31.9	+ 5.7	45.6	5.7	39.9	7	3.205	14	9.0	N 89 W	2.50	6.84 "
1858	27.4	+ 1.2	43.6	5.0	38.6	11	1.657	18	10.4	N 78 W	1.66	9.36 "
1859	17.9	— 8.3	54.8	— 3.3	58.1	3	1.035	23	37.4	N 53 W	4.29	10.77 "
1860	24.0	— 2.2	38.5	— 7.0	45.5	3	1.362	21	13.5	N 62 W	4.66	10.14 "
1861	31.1	+ 4.9	55.1	5.7	49.4	6	0.560	8	6.8	N 72 W	3.50	7.96 "
1862	28.8	+ 2.6	50.0	— 2.3	52.3	5	1.945	8	10.4	N 73 W	3.17	7.58 "
1863	27.0	+ 0.8	51.5	1.0	50.5	10	2.960	17	7.1	N 41 W	1.61	9.40 "
1864	24.7	— 1.5	46.8	— 2.3	49.1	9	2.045	18	27.1	S 82 W	4.94	9.98 "
1865	27.7	— 1.5	50.4	5.7	44.7	7	1.727	11	5.2	S 81 W	3.07	7.33 "
1866	25.1	— 1.1	50.4	— 4.3	54.7	7	2.790	13	15.5	S 88 W	4.98	9.91 "
Results to 1864.	26.20	...	45.76	—0.78	46.54	5.6	1.641	13.1	14.69	N 71 W	2.9	8.32
Exc. for 1866.	—1.14	...	+4.64	—3.52	+8.16	+ 1.4	+ 1.149	— 0.1	+ 0.81	...	...	+1.59

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FOR THE ADVANCEMENT
OF SCIENCE

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THE CANADIAN JOURNAL.

NEW SERIES.

No. LXVI.—DECEMBER, 1867.

CHRISTIAN EPITAPHS OF THE FIRST SIX CENTURIES.

BY THE REV. JOHN McCAUL, LL.D.,
PRESIDENT OF UNIVERSITY COLLEGE, TORONTO, ETC.

V. Those in which the Occupation or Position in Life of the Deceased is Stated.

A. *Secular.*

(*a.*) To a member of the Imperial household:— 49.

M · AVRELIO · AVGG · LIB · PROSENETI
A CVBICVLO · AVG ·
PROC · THESAVRORVM
PROC · PATRIMONI · PROC ·
MVNERVM · PROC · VINORVM
ORDINATOADIVOCOMMODO
IN KASTRENSE PATRONO PIISSIMO
LIBERTI · BENEMERENTI
SARCOPHAGVM DE SVO ·
ADORNAVERVNT ·
PROSENES RECEPTVS ADDEVM · V · NON***SSA**********NIA ·
[PRAESENTE · ET · EXTRICATO · II
REGREDIENS IN VRBE AB EXPEDITI ONIBVS SCRIPSIT
[AMPELIVS LIB

(*Via Labicana;* De Rossi, n. 5.)

Marco Aurelio, Augustorum liberto, Proseneti, a cubiculo Augusti, Procuratori thesaurorum, Procuratori patrimonii, Procuratori munerum, Procuratori vinorum, ordinato a Divo Commodo in Castrense, Patrono piissimo, liberti benemerenti sarcophagum de suo adornaverunt. Prosenes receptus ad Deum quinto Nonas . . . . . . Præsente et Extricato iterum. Regrediens in urbe (urbem) *ab expeditionibus scripsit Ampelius libertus.*

"To Marcus Aurelius Prosenes, freedman of the two Augusti, of the bed-chamber of Augustus, Procurator of the Treasures, Procurator of the Patrimony, Procurator of the Presents, Procurator of the Wines, appointed by the Deified Commodus to duty in the Camp, a most affectionate Patron. For him, well-deserving, his freedmen provided (this) sarcophagus, at their own cost."

"Prosenes received to God, on the fifth day before the Nones of . . . . (in the Consulship of) Præsens, and Extricatus for the second time," *i.e.* . . . . 217 A.D.

"Ampelius, his freedman, returning to the city from the wars, set up this inscription."

l. 1. *Augg.* Marcus Aurelius and Lucius Verus. l. 2. *Aug.* Commodus. l. 2. *In Kastrense. Scil. munus*, or *officium.* Henzen remarks, "= *ratio castrensis.*" l. 11. *Receptus ad Deum.* This phrase may be regarded as sufficient proof of the Christianity of either *Ampelius*, or both *Prosenes* and *Ampelius*. In Henzen's n. 7418, a Pagan *titulus*, we have the similar phrase, *spiritus inter Deos receptus*, where, also, the word *refrigerat* or *refrigeras*, so common in Christian epitaphs, is strangely used. It is remarkable that this same expression occurs in another Pagan epitaph, given by Muratori, 978, 9, with the statement: "*Romæ. In Coemeterio Callisti. Ex Boldetto.*" The commencement of the two epitaphs is identical: *D · M · in hoc tumulo jacet corpus exanimis* (exanime) *cujus spiritus inter Deos receptus est; sic enim meruit.* And in both we have, *cujus fama in eterna* (in Muratori, *æterno*) *nota est;* but the division into lines is not the same, and, besides many other differences, the name of the deceased in the former, is *M. Ulpius Maximus*, in the latter, *L. Statius Onesimus.* Henzen, n. 6344, copies the inscription to Prosenes, but without the lines given above in smaller type, and, consequently, treats the inscription as Pagan.

l. 11. V · NON. After NON some letters are defaced; before SSA there are traces like III. De Rossi suggests, with a query, [APRI]LIS, *i.e. April 1st.* There are examples of this notation of time, without mention of the Calends (see n. 12); but I am not aware of any instance at so early a period as 217. I am unable to offer any feasible conjecture as to the letters obliterated between SA and NIA. l. 12. *Scripsit Ampelius lib.* Thus, we have in Orelli, n. 4692: *Lib. Scripserunt.*

50.

IVLIVS FELIX VALENTINIANVS · VC · ET $\overline{sp}$
EX SILENTIARIO SACRI PALATII EX CO$\overline{\mathrm{M}}$ ·
CONSISTORII · CO$\overline{\mathrm{M}}$ · DO$\overline{\mathrm{M}}$ · QVI VIX*it*
ANN · LXVII · $\overline{\mathrm{MENS}}$ · IIII · D · XXV $\overline{\mathrm{DE}}$P · IN PACE
$\overline{\mathrm{FL}}$ · EVTHARICO · CILLIGA · $\overline{\mathrm{VC}}$ · C$\overline{\mathrm{ONS}}$

(*In Mus. Capit.;* De Rossi, n. 968.)

Julius Felix Valentinianus, Vir Clarissimus et Spectabilis, Ex Silentiario Sacri Palatii, Ex Comite Consistorii, Comes Domesticorum, qui vixit annos LXVII, menses IV, dies XXV. Depositus in pace, Flavio Eutharico Cilliga (Cillica), *Viro Clarissimo, Consule.*

"Julius Felix Valentinianus, a man of the highest distinction and consideration, ex-Silentiary of the Sacred Palace, ex-Count of the Consistory, Count of the Household Troops, who lived sixty-seven years, four months, twenty-five days. Buried, in peace, in the Consulship of Flavius Eutharic Cillica, a most distinguished man," *i.e.* 519, A.D.

l. 1. *Sp.* I have adopted De Rossi's certain restoration. Valentinian was *Spectabilis* as *Comes Domesticorum.* Other titles of honor are: V · C · = *Vir Clarissimus;* V · D · = *Vir Devotus,* or *Devotissimus;* V · I · = *Vir Illustris;* V · P · = *Vir Perfectissimus,* &c. On the application of these titles according to rank or position, see Böcking's edition of the *Notitia,* and Gothofred's edition of the Code of Justinian. It is impossible to find English adjectives that satisfactorily express these grades of titular dignity or compliment.

(*b.*) To a lawyer:— 51.

FELIX VITA VIRI FELICIOR EXITVS IPSE
CAIANI SEMPER CRESCIT PER SAECVLA NOMEN
NESCIT FAMA MORI SED SEMPER VIBIT VBIQVE
ADVENIT HOSPES ROMANVS PRINCEPS · IN VRBEM
QVI FVIT HIC PRIMVM IVRIS CONSVLTOR AMICVS
QVIESCITINPACEMDEPOSITVS DIEM QVAR

TVM NONAS AVGV
STAS FLAVIO FILIPPO
ET FLAVIO SALLEA CON
SVLIBVS PATER SABBA
TIVS FE CIT

(?; De Rossi, n. 101.)

Felix vita viri, felicior exitus ipse!
Caiani semper crescit per sæcula nomen.
Nescit fama mori, sed semper vibit (vivit) *ubique.*
Advenit hospes Romanus princeps in urbem,
Qui fuit hic primum juris consultor amicus.

Quiescit in pacem (pace), *depositus diem* (die) *quartum* (quarto) *nonas Augustas, Flavio Filippo* (Philippo) *et Flavio Sallea* (Salia) *Consulibus, Pater Sabbatius fecit.*

"Happy the life of the man, happier the death itself! The renown of Caianus shall ever increase throughout (all) ages. Fame knows not death, but ever lives, and everywhere. The Roman Emperor came, a stranger, to the city, whose first friend was this lawyer. He rests in peace. Buried on the fourth day before the Nones of August, in the Consulship of Flavius Phiippus and Flavius Salia (*i.e.* August 2nd, 348, A.D.) His father, Sabbatius, made" (this).

l. 2. Read *crescet* for *crescit.* l. 4. Read *princeps Romanus* for *Romanus princeps*, or insert *princeps* between *advenit* and *hospes.* l. 5. Read *cui* for *qui*, and *primus* for *primum.* The Roman Emperor was Constantine the Great, and the year, which is referred to, of his coming to Rome, is 326, A.D.

(*c.*) To a præfect of the city:— 52.

IVN·BASSVS·V·C·QVI VIXIT ANNIS·XLII MEN·II IN IPSA PRAEFECTURA
[VRBI NEOFITVS IIT AD DEVM·VIII·KAL·SEPT EVSEBIO ET YPATIO·COSS

(*In cryptis Vaticanis;* De Rossi, n. 141.)

Junius Bassus, Vir Clarissimus, qui vixit annis (annos) *XLII, menses II. In ipsa præfectura urbis neofitus* (neophytus) *ivit ad Deum, VIII Kalendas Septembres, Eusebio et Ypatio* (Hypatio), *Consulibus.*

"Junius Bassus, a most distinguished man, who lived forty-two years, two months. Whilst holding the office of Præfect of the City, he, a neophyte, went to God on the 8th day before the Calends of September, in the Consulship of Eusebius and Hypatius," *i.e.* August 25th, 359, A.D.

(*d.*) To a physician:— 53.

RAPETIGAME
DICVS CIVIS
HISPANVS QVI
VIXITINPANNPM
XXVHOCPATERNI
CAITVSFECITDNMA
MAXIMOAVGII

(*E coem. Cyriacæ;* De Rossi, n. 375.)

Rapetiga, medicus, civis Hispanus, qui vixit in p(ace) *annos plus minus viginti quinque. Hoc pater Nicaitus* (Nicetius) *fecit, Domino Nostro Magno Maximo Augusto iterum.*

"Rapetiga, a physician, a citizen of Spain, who lived in peace twenty-five years, more or less. Nicetius, his father, made this, in the Consulship of our Lord Magnus Maximus Augustus, for the second time," *i.e.* 388, A.D.

(*e.*) To a baker:— 54.

HIC EST POSITVS BITALIS PISTOR /NA
SHICESRSXIIOVIBICSITAN
NVSPLMINVSNXLVDEPC
SITVSINPACINATALED
OMNESSITIRETISTERT
IVMIDVSFEBBCONSVL/
TVMΓLV MCEN T I VV CC
CONSS

(*In coenobio S. Pauli via Ostiensi;* De Rossi, n. 495.)

Hic est positus Bitalis (Vitalis) *pistor* . . . . . *regionis XII, ovi* (qui) *vicsit* (vixit) *annus* (annos) *plus minus numero XLV. Depositus in paci* (pace) *natale* (natali) *Domnes* (Dominæ) *Sitiretis* (Soteridis) *tertium* (tertio) *Idus Februarias Consulatum* (Consulatu) *Flavii Vincentii* [et Fraviti], *Virorum Clarissimorum, Consulum.*

"Here has been placed Vitalis, a baker . . . . . of the twelfth region, who lived forty-five years, more or less. Buried, in peace, on the birth-day of Saint *Soteres, the third day before the Ides of February, in the Consulship of Flavius Vincentius [and Fravitus], most distinguished men, Consuls, *i.e.* February 11th, 401, A.D.

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* Thus, De Rossi, *Index*, p. 619; but Aringhi, i., p. 288, gives *Soter. Soter* is the name of a man; *Soteres*—otherwise *Soteris* and *Soteria* (in Jewish epitaphs, Orelli, n. 2523, Henzen, n. 6144)—is the name of a woman. Hence, in epitaph n. 46, I should prefer the translation, "Lampadius and Soteres, his most affectionate brother and sister," to the version

l. 1. No one has yet been able to explain the word or words formed by the letters between *pistor* and *rs* (regionis). Le Blant, *Inscr. Chrét. de la Gaule*, i., 279, reads—MAGHICES; but De Rossi, p. 577, justly rejects this, observing that the *character between R and A contains two letters, and may be read either MI, or INI, or even AN. l. 2. RSXII. Ancient Rome was divided into fourteen regions. This baker had his shop in the twelfth. Thus, in Orelli, n. 1455, we have *pistor Romaniensis ex regione XIIII.* ll. 4, 5. *Domnes. Domina*, like the Greek κυρία, = our "Mistress," was a term of respect applied to females. It is commonly applied to the same who were otherwise called "*Sanctæ.*" l. 5. *Sitiretis.* This Saint is said to have suffered martyrdom, in the Appian Road, under Diocletian and Maximian, 304, A.D. See Aringhi, i., p. 288. l. 7. *Fl. Vincenti.* As he alone is mentioned, it appears that the name of the Eastern Consul, *Fravitus*, or *Fravita*, was not at the time known in Rome; and yet the plural—VVCC CONSS—is used, as if both names had been given.

(*f.*) To a gardener:— 55.

PASCASIVS · ORTOLANV
ϘI IDSIVLIASCOLSDECI$\overline{\text{VC}}$C

(*In S. Agnetis;* De Rossi, n. 1020.)

[Hic quiescit] *Pascasius ortolanu* (hortulanus), [depositus] *septimo Idus Julias, Consulatu Decii, Viri Clarissimi, Consulis.*

"[Here rests] Pascasius, a gardener, buried on the seventh day before the Ides of July, in the Consulship of Decius, a most distinguished man, Consul," *i.e.* July 9th, 529, or rather, 486, A.D.

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there given. Thus, *fratribus*, in Orelli, n. 4583; *fratrum*, in Tacitus, Ann. xii., 4; and "*Lucius et Titia fratres emancipati a patre*," in Paul., *Dig.* x., 2, 38, cited by *Forcellini, in verb.*

* This character occurs in Roman inscriptions found in Britain, *e.gr.* in a very perplexing one to the *Deæ Matres*, figured in the "Report of the Yorkshire Philosophical Society, for 1861." It seems as if it might also be read NV, or MV, or NN. De Rossi, in his comment, remarks: "*Vox, quæ postremis versus primi et prioribus secundi litteris continetur, millies a me tentata est, sed irrito semper conatu.*" As this has, also, been the result of my experience, I merely state my impression, that the word is an Ethnic adjective, like *Romaniensis.*

(*g.*) To an ex-quæstor:— 56.

HIC REQVIESCINT IN PACE PRAETEXTATVS $\overline{\text{VI}}$ EX
QVESTOR $\overline{\text{SCP}}$ · $\overline{\text{DP}}$ · VII · IDVS · OCTOBR · FESTO $\overline{\text{VC}}$ · CONS
ET FILIA EIVS PRAETEXTATA · $\overline{\text{CF}}$ · $\overline{\text{DP}}$ · XV · $\overline{\text{KAL}}$ ·
[AVG . DECIO $\overline{\text{VC}}$ $\overline{\text{C}}$

(*In S. Martini;* De Rossi, n. 844.)

Hic requiescint (requiescunt) *in pace Prætextatus, Vir Illustris, ex-quæstore Sacri Palatii, depositus VII Idus Octobres, Festo, Viro Clarissimo, Consule, et filia ejus Prætextata, Clarissima Femina, deposita XV Kalendas Augustas, Decio, Viro Clarissimo, Consule.*

"Here rest in peace, Prætextatus, an illustrious man, ex-quæstor of the Sacred Palace, buried on the seventh day before the Ides of October, in the Consulship of Festus, a most distinguished man (*i.e.* October 9th, 472, A.D.), and his daughter Prætextata, a most distinguished woman, buried on the fifteenth day before the Calends of August, in the Consulship of Decius, a most distinguished man," *i.e.* July 18th, 486, A.D.

l. 2. SCP. *Sacri Palatii, scil.* of the Emperor. See Epitaph n. 50, and *Notitia*, chap. xv. and xiv., vol. ii., ed. Böcking.

(*h.*) To a soldier:— 57.

ΕΝΘΑΔΕΤΟΝΑΓΡΗΓΟΡΟΝ
ΥΠΝΟΝΚΑΘΕΥΔΕΙΦΙΛΕ
ΕΥΓΝΩΜΟΝΙΟΣΠΡΟΤΙΚΤΟΡ
ΤΩΝΓΕΝΝΑΙΟΤΑΤΩΝ
ΑΡΙΘΜΟΥΜΑΡΤΗΣΙΩΝΠΡΟ
ΑΠΕΛΘΩΝΤΟΥΚΑΘΗΜΑΣ
ΒΙΟΥΜΗΝΙΙΟΥΛΙΟΥΔΕΚΑ
ΤΗΙΝΔΕΝΔΕΚΑΤΗΥΙΤΑ
Τ . . . ΣΦΑΒΙΟΥΜΑΓΝΟΥ
. . . . . ΤΟΥΜΕΓΑΛΟΠRΕ
ΥΧ

(*In Museo Parisiensi;* Kirchhoff, n. 9449.)

Ἐνθάδε τὸν ἀγρήγορον ὕπνον καθεύδει, φίλε, Εὐγνωμόνιος, προτίκτορ (προτίκτωρ) τῶν γενναιοτάτων ἀριθμοῦ Μαρτησίων, προαπελθὼν τοῦ καθ' ἡμᾶς βίου μηνὶ Ἰουλίου δεκάτῃ, ἰνδικτιῶνι ἑνδεκάτῃ, ὑπατίας Φαβίου Μάγνου [μόνου] τοῦ μεγαλοπρεπεστάτου.

"Here, friend, Eugnomonius sleeps the sleep that knows no waking, a Protector, of the detachment of the most noble Martenses, having gone before from our life on the tenth of the month of July, in the eleventh Indiction, in the Consulship of Fabius Magnus [alone], the most distinguished," *i.e.* July 10th, 518, A.D.

l. 5. *ἀριθμοῦ.* This is used as the Latin *numerus.* A body of the *Martenses* is mentioned in the *Notitia*, as stationed at *Aletum*, now St. Malo.

(*i.*) To a præfect of the market:— 58.

HIC REQVIESCIT IN PACE SABINVS $\overline{\text{VS}}$ $\overline{\text{PRE}}$ $\overline{\text{ANNS}}$ QVI
[BISSIT ANNVS
LIIII ET DIES XXIIII $\overline{\text{DP}}$ XVI KAL AGVSTAS $\overline{\text{CONS}}$
[SYMM ET BOETIO $\overline{\text{VC}}$ $\overline{\text{CONSS}}$

(*In atrio coem. S. Pauli;* De Rossi, n. 978.)

Hic requiescit in pace, Sabinus, Vir Spectabilis, Præfectus annonaes (annonæ), *qui bissit* (vixit) *annus* (annos) *LIV, et dies XXIV. Depositus XVI Kalendas Agustas* (Augustas), *Consulatu Symmachi et Boetio* (Boetii), *Virorum Clarissimorum, Consulum.*

"Here rests in peace, Sabinus, a man of high consideration, Præfect of the Market, who lived fifty-four years, and twenty-four days. Buried on the sixteenth day before the Calends of August, in the Consulship of Symmachus and Boetius, most distinguished men, Consuls," *i.e.* July 17th, 522, A.D.

In the expansion I have corrected the formula given for the Consulship. It was, doubtless, *Consulatu Symmacho et Boetio Viris Clarissimis Consulibus.* In De Rossi's, n. 977, we have the strange mixture, *Consulatu Symmaci et Boeti Viris Consulibus.*

(*k.*) To a keeper of a public granary:— 59.

HIC REQVIESCITINPACECONSTANTINVSHOR
REARIVSQVIVISETPM·AN·XLVII DIPOSITVSESTVII·$\overline{\text{KA}}$
DEC·CO$\overline{\text{N}}$SFL·LAMPADIETORESTISV$\overline{\text{V}}$·$\overline{\text{CC}}$

(*In coenob. S. Pauli;* De Rossi, n. 1026.)

Hic requiescit in pace Constantinus horrearius, qui viset (vixit) *plus minus annos XLVII. Dipositus* (depositus) *est VII Kalendas Decembres, Consulatu Flavii Lampadii et Orestis, Virorum Clarissimorum.*

"Here rests in peace, Constantinus, a granary-keeper, who lived forty-seven years, more or less. He was buried on the seventh day before the Calends of December, in the Consulship of Flavius Lampadius and Orestes, most distinguished men," *i.e.* November 25th, 530, A.D.

I am unable (without type specially cut for the purpose) to represent the numerals after AN and before KA, as they appear in the inscription. They are given as they were read by Muratori, 421, 2.

(*l.*) To a book-keeper:— 60.

HIC REQVIESCIT IN PACE IOHANNIS $\overline{\text{VH}}$
OLOGRAFVS PROPINE ISIDORI QVI VIX*it*
$\overline{\text{ANN}}$ · PLVS $\overline{\text{M}}$ · XLV $\overline{\text{DEP}}$ · X KALE$\overline{\text{N}}$ · IVNIA*s*
CONSVLATV VILISARI $\overline{\text{VC}}$ ·

(*In crypt. Vatic.;* De Rossi, n. 1055.)

Hic requiescit in pace, Johannis (Johannes), *Vir Honestus, olografus* (olographus) *propine* (propinæ) *Isidori, qui vixit annos plus minus XLV. Depositus X Kalendas Junias, consulatu Vilisari* (Belisarii), *Viri Clarissimi.*

"Here rests in peace, Johannes, a respectable man, the book-keeper of the tavern of Isidorus, who lived forty-five years, more or less. Buried on the tenth day before the Calends of June, in the Consulship of Belisarius, a most distinguished man," *i.e.* May 23rd, 535, A.D.

I have adopted Marini's interpretation of *Holographus*, as explained by De Rossi, but I know no ancient authority for this signification. Although there are strong objections to receiving "the Consulship of Belisarius" as marking the year 535 in an Italian inscription, yet I have not ventured to follow De Rossi, who proposes the insertion of *post* after IVNIAS, *i.e. post consulatu* (consulatum) *Vilisari VC, scil.* A.D. 536 or 537.

B. *Ecclesiastical.*

(*a.*) To a bishop:— 61.

HICREQVIES
CITSANCTAE MEMO
RIÆPATERNOSTER
REPARATVSE · P · S · QVIFE
CITINSACERDOTIVMAN
NOSVIIIIMENXIETPRE
CESSITNOSINPACE
DIEVNDECIMV · KAL
AVGPROVNC · CCCCXXX
ETSEXTA

(*Orleansville in Algiers;* Renier, n. 3701.)

Hic requiescit sanctæ memoriæ pater noster, Reparatus, episcopus, qui fecit in sacerdotium (sacerdotio), *annos IX, menses XI, et precessit nos in pace, die undecimu* (undecimo) *Kalendas Augustas, Provinciæ* [anno] *quadringentesimo tricesimo et sexta* (sexto).

"Here rests our father of holy memory, Reparatus, the Bishop, who passed in his priesthood nine years, eleven months; and went before us, in peace, on the eleventh day before the Calends of August, in the 436th year of the Province," *i.e.* July 22nd, 475, A.D.

l. 1. *Sacerdotium.* The bishops in Africa were sometimes called *Sacerdotes.* See Renier, n. 3704. The æra of the Province dated from 40, A.D., the year in which Mauretania was reduced. See Henzen, n. 5337; Renier, *Revue Arch.*, xi. 443, xv. 565; Mommsen, *Epigraphische Analekten*, n. 20, in *Berichte der phil. Hist.*, 1852, p. 313.

(*b.*) To a presbyter :— 62.

PRAESBYTER HIC SITVS EST CELERINVS NOMINE DIC[*tus*]
CORPOREOS RVMPENS NEXVS QVI GAVDET IN ASTRIS
DEP VIIII KAL IVN FL SYAGRIO ET EVCERIO

(*In S. Agnetis via Nomentana;* De Rossi, n. 303.)

Presbyter hic situs est Celerinus nomine dictus,
Corporeos rumpens nexus qui gaudet in astris.
Depositus IX Kalendas Junias, Flavio Syagrio et Eucerio.

"Here has been laid a Presbyter, called by the name Celerinus, who, breaking the bonds of the body, rejoices in the stars (in heaven). Buried on the ninth day before the Calends of June, in the Consulship of Syagrius and Eucherius," *i.e.* May 24th, A.D. 381.

In Kirchhoff's n. 9258, found at Ancyra, in Galatia, we have an example of a presbyter pursuing a secular occupation:—
ὁ δοῦλος τοῦ Θεοῦ Θεόδωρος πρεσβύτερος τῶν ἁγίον (ἁγίων) κὲ (καὶ) ἀργυροκόπος, *i.e.* "the servant of God, Theodorus, a presbyter (of the church) of the Saints (All Saints?), and a silversmith."

(*c.*) To the wife of a presbyter:— 63.

GAVDENTIVS · PRESB · SIBI
ET CONIVGI SVAE SEVERAE CASTAE HAC SANC[*tissimæ*]
FEMINAE QVAE VIXIT ANN · XLII · M · III · D · X
DEP III · NON · APRIL · TIMASIO ET PROMOTO

(*In coem. S. Pauli via Ostiensi;* De Rossi, n. 376.)

Gaudentius Presbyter sibi et conjugi suæ Severæ, castæ hac (ac) *sanctissimæ feminæ, quæ vixit annos XLII, menses III, dies X. Deposita IV Nonas Apriles, Timasio et Promoto.*

"Gaudentius, a Presbyter, for himself, and his wife Severa, a chaste and most holy woman, who lived forty-two years, three months, ten days. Buried on the fourth day before the Nones of April, in the Consulship of Timasius and Promotus," *i.e.* April 2nd, A.D. 389.

(*d.*) To a deacon:— 64.

DEPS · FELIX DIAC · V · IDVS · MARTIAS ·
THEODOSIO · XV · ET · PLD · VALENTINIANO IIII
AA · VV · CC · CON · SS

(*In crypt. basil. Vaticanæ;* De Rossi, n. 684.)

Depositus Felix Diaconus, V Idus Martias, Theodosio XV et Placido Valentiniano IV, Augustis, Viris Clarissimis, Consulibus.

"Felix, a Deacon, was buried on the fifth day before the Ides of March, in the Consulship of Theodosius for the fifteenth time, and Placidus Valentinianus for the fourth time, Augusti, most distinguished men," *i.e.* March 11th, A.D. 435.

(*e.*) To a deacon's wife and children:— 65.

LEVITAE CONIVNX PETRONIA FORMA PVDORIS · HIS MEA DEPONENS SEDIBVS
[OSSA LOCO
PARCITE VOS LACRIMIS DVLCES CVM CONIVGE NATAE · VIVENTEMQVE DEO CRE-
[DITE FLERE NEFAS
DP · IN PACE III · NON OCTOB FESTO VC CONSS
HIC REQVIESCIT IN PACE PAVLA CLF · DVLCIS BENIGNA GRATIOSA FILIASS
DP VII KAL SEPT . . . . F NANTO VC CONSS
HIC REQVIESCIT DVLCISSIMVS PVER GORDIANVS FILIVS SS
DP · ID SEPT · SYMMACHO VC CONSS
HIC REQVIESCIT AEMILIANA SAC · VG · DPV · ID · DEC · PROBINO VC · CONSS ·

(*In S. Pauli;* De Rossi, n. 843.)

Levitæ conjunx Petronia forma pudoris—His mea deponens sedi-
[bus ossa loco.
Parcite vos lacrimis dulces cum conjuge natæ—Viventemque Deo
[credite flere nefas.
Deposita in pace tertio Nonas Octobres, Festo, Viro Clarissimo,
[Consule.
Hic requiescit in pace Paula clarissima fæmina dulcis benigna gra-
[tiosa filia supra scriptæ.
Deposita septimo Kalendas Septembres, Venantio, Viro Clarissimo,
[Consule.

Hic requiescit dulcissimus puer Gordianus filius supra scriptæ.
Depositus Idibus Septembribus, Symmacho, Viro Clarissimo, Consule.
Hic requiescit Æmiliana Sacra Virgo. Deposita quinto Idus De-
[cembres, Probino, Viro Clarissimo, Consule.

"I, Petronia, the wife of a Deacon, the type of modesty, lay down my bones in this resting-place. Refrain from tears, my sweet daughters and husband, and believe that it is forbidden to weep for one who lives in God. Buried, in peace, on the third day before the Nones of October (*i.e.* October 5th), in the Consulship of Festus, a most distinguished man, *i.e.* 472, A.D. Here rests in peace, Paula, a most distinguished woman, the sweet, kind, gracious daughter of the above mentioned; buried on the seventh day before the Calends of September (*i.e.* August 26th), in the Consulship of Venantius, a most distinguished man, *i.e.* 484, A.D. Here rests a very sweet boy, Gordianus, son of the above mentioned; buried on the Ides of September (*i.e.* September 13th), in the Consulship of Symmachus, a most distinguished man, *i.e.* 485, A.D. Here rests Æmiliana, a sacred virgin; buried on the fifth day before the Ides of December (*i.e.* December 9th), in the Consulship of Probinus, a most distinguished man," *i.e.* 489, A.D.

l. 1. *Levitæ.* This term is used for *Diaconus,* as the latter is unsuitable for hexameters. The difficulty is got over sometimes by syncope, *scil. Diacnus,* as by *Venantius;* sometimes by using *Zaconus,* for *Diaconus.* I have regarded *Petronia* as supposed to speak from the beginning. Others will, perhaps, prefer taking the first verse as expressed by the author of the epitaph. De Rossi's comment is well worth reading. It contains a most ingenious and conclusive argument, that Gregory the Great was a descendant of the persons named in this epitaph.

(*f.*) To a sub-deacon:— 66.

HIC QVIESCET APPIANVS SVBDIACONVS QVI VIXIT
[ANNVS
XXXII DIES XXVIIII D III IDVS APRI$\overline{\text{CON}}$ POSTV-
[MIANI $\overline{\text{VC}}$

(*In basil. S. Alexandri via Nomentana;* De Rossi, n. 743.)

Hic quiescet (quiescit) *Appianus, Subdiaconus, qui vixit annus* (annos) *XXXII, dies XXVIIII. Depositus tertio Idus Apriles, Consulatu Postumiani, Viri Clarissimi.*

"Here rests Appianus, a Sub-deacon, who lived thirty-two years, twenty-nine days. Buried on the third day before the Ides of April, in the Consulship of Postumianus, a most distinguished man," *i.e.* April 11th, 448, A.D.

67.

LOCVS MARCELLI SVBD·REG·SEXTE CONCESSVM SIBI
[ET POS
TERIS EIVS A BEATISSIMO PAPA IOANNE
QVI VIXIT ANN·PLM·LXVIII DEP PC BASILI VC ANN
IND·XI·VNDECIMV KAL IANVARIAS [XXII

(*In crypt. basil. Vaticanæ;* De Rossi, n. 1096.)

Locus Marcelli, Subdiaconi Regionis sexte (sextæ), *concessum* (concessus) *sibi et posteris ejus a beatissimo Papa Joanne, qui vixit annos plus minus LXVIII. Depositus post consulatum Basilii, Viri Clarissimi, anno XXII, Indictione XI, undecimu* (undecimo) *Kalendas Januarias.*

"The place of Marcellus, a Sub-deacon of the Sixth District, conceded to him, and to his posterity, by the most blessed Father John, who lived sixty-eight years, more or less. Buried in the twenty-second year after the Consulship of Basilius, a most distinguished man (*i.e.* 563, A.D.), in the eleventh Indiction, on the eleventh day before the Calends of January," *i.e.* December 22nd.

l. 1, *Regionis sextæ.* Pagan Rome was divided, as I have mentioned in the notes on epitaph 54, into fourteen regions, or districts. The ecclesiastical division was into seven.

(*g.*) To an acolyte:— 68.

VS ACOLVT*us*
N CONSS·HO*norio.*

(*In S. Pauli;* De Rossi, n. 631)

. . . *us Acolutus* . . . . . . *n Consulibus Honorio et* . . . . .

" . . . us, an Acolyte, ... n, in the Consulship of Honorius and . . . . . ," *i.e.* 422, or 418, or 417, or 415, or 412, or 409, or 407, or 398, or 386, A.D.

This is the only notice of an Acolyte that I have observed in a *Roman dated epitaph. As the inscription is very defective, in consequence of the fracture of the stone, I subjoin another, but without the year:—

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* In Mommsen's *Inscrip. Neapol.*, n. 1305, we have one, found at Æclanum, to *Murrasius Acoletus* (*sic*) of the date 529. A.D.

ACE ABVNDANTIVS ACOL ·
REG · QVARTE TT VESTINE QVI VIXIT ANN · XXX
DEP · INP · D NAT · SCI · MARCI MENSE SE OCT · IND XII

(*In S. Agnetis via Nomentana;* De Rossi, n. 1185.)

[Hic requiescit in p]*ace, Abundantius, Acolutus Regionis quarte* (quartæ), *Tituli Vestine* (Vestinæ), *qui vixit annos XXX. Depositus in pace die natali Sancti Marci mense Octobri, Indictione XII.*

"Here rests in peace, Abundantius, an Acolyte of the Fourth District, of the parish-church of Vestina, who lived thirty-years. Buried, in peace, on the birth-day of Saint Mark, in the month of October, in the twefth Indiction."

l. 2. *Regionis quartæ.* See note on epitaph n. 68. *Tituli Vestinæ.* On this meaning of *Titulus,* see Du Cange, *in verb.* l. 3. *Die natali Sci Marci.* This Saint Mark is the Pope of that name, who succeeded Saint Sylvester, in 336, A.D. SE. These letters were repeated in mistake by the stone-cutter. Reinesius assigns 414, A.D., as the date of this inscription, but there is no ground for fixing even the century. Jacuti places it in the fourth; but De Rossi's suggestion, that it was of the sixth or seventh, is much more probable. This inscription, is, at present, to be seen in the portico of the Basilica of St. Mark; it is, however, not the original, for that is not extant, but a modern copy on marble.

(*h.*) To an exorcist:— 69.

HIC · REQVIESCIT · IN
SOMNO · PACIS · CAELIVS
IVHANNIS · EXHORCISTA
QVI · VIXIT ANN^{S} · PL^{S} · M^{S} · γ
ΔEPOSITIO · EIVS · CII · IDS
ΔECEMBRES · FL^{S} · FELICE · V · C
CONSVLE

(*Æclani;* Mommsen, I. N., 1293.)

Hic requiescit in somno pacis Cælius Juhannis (Johannes), *exhorcista* (exorcista), *qui vixit annos plus minus γ. Depositio ejus VIII Idus Decembres, Flavius* (Flavio) *Felice, Viro Clarissimo, Consule.*

"Here rests, in the sleep of peace, Cælius John, an exorcist, who lived . . . . . . years, more or less. His burial took place on the eighth day before the Ides of December, in the Consulship of Flavius Felix, a most distinguished man," *i.e.* December 6th, 511, A.D.

l. 4. Mommsen remarks: "*Guarini vidit et* 4γ *explicavit XX.*" l. 5. I have taken the character before II for Ͷ = Ϛ = 6. On the year, see De Rossi, p. 425.

(*i.*) To a reader:— 70.

(See Plate III, 2.)

(*E coem. Callisti et Prætextati;* De Rossi, n. 48.)

Equitius Heraclius, qui fuit in sæculum (sæculo) *annos XIX, menses VII, dies XX, lector regionis secundæ.* [Parentes] *fecerun*(t) *sibi et filio suo benemerenti in pace. Deces*(s)*it VII Irus* (Idus) *Februarias, Urso et Polemio Consulibus.*

"Equitius Heraclius, who was in this world nineteen years, seven months, twenty days, a Reader of the Second Region. [His parents] made (this) for themselves, and their well-deserving son, in peace. He departed on the seventh day before the Ides of February, in the Consulship of Ursus and Polemius," *i.e.* February 7th, 338, A.D.

71.

HIC REQVIESCIT IN SoMNo
PACIS CAELIVS LAVRENTIVS
LECTOR SANCTAE ECCLESIAE
AECLANENSIS QVI VIXIT
ANNoS PL M·XLVIII DEPoSITIo
EIVS DIE VII IDVS MAIAS FLAVIS
ASTERIo ET PRAESIDIo VV CC CoN

(*E crypt. Æclanis;* Mommsen, I. N., 1299.)

Hic requiescit in somno pacis Cælius Laurentius, lector sanctæ ecclesiæ Æclanensis, qui vixit annos plus minus XLVIII. Depositio ejus die VII Idus Maias, Flaviis Asterio et Præsidio, Viris Clarissimis, Consulibus.

"Here rests, in the sleep of peace, Cælius Laurentius, a Reader of the holy church of Æclanum, who lived forty-eight years, more or less. His burial (took place) on the seventh day before the Ides of May, in the Consulship of Flavius Asterius and Flavius Præsidius, most distinguished men," *i.e.* May 9th, 494, A.D.

(*k.*) To a custodian:— 72.

*lo*C DECI · CVBICVLARI · HVI*us basilicæ*
*hic q*VIESCIT CARO MEA NO*vissimo vero die*
per $\overline{\text{XPM}}$ CREDO RESVSC*itabitur a mortuis*
dep · XV KAL · IVN · ET ITER · P*c* · (basili v · c?)

(*In S. Pauli;* De Rossi, n. 1087.)

Locus Decii cubicularii hujus basilicæ. Hic quiescit caro mea; novissimo vero die per Christum credo resuscitabitur a mortuis. Depositus XV Kalendas Junias et iterum post consulatum Basilii, Viri Clarissimi.

"The place of Decius, Custodian of this Basilica. Here rests my flesh, but, at the last day, through Christ, I believe it will be raised from the dead. Buried on the fifteenth day before the Calends of June, in the third year after the Consulship of Basilius, a most distinguished man," *i.e.* 544, A.D.

In the text, the letters in Italics are given according to De Rossi's restoration.

(*l.*) To a deaconess:— 73.

HIC IN PACE REQVIESCIT B·M
THEODORA DIACONISSA QVAE
VIXIT IN SECVLO ANNOS PL·MIN
XLVIII·D·XI·KAL·AVG·V·P·C·
PAVLINI $\overline{\text{IVN}}$·V·C·IND·II

(*Ticini in Sanctissimæ Trinitatis;* Muratori, 424, 6.)

Hic in pace requiescit bonæ memoriæ Theodora Diaconissa quæ vixit in seculo (sæculo) *annos plus minus XLVIII. Deposita XI Kalendas Augustas, quinto post consulatum Paulini Junioris, Viri Clarissimi, Indictione secunda.*

"Here rests in peace, Theodora, a Deaconess, of good repute, who lived in this world forty-eight years, more or less. Buried on the eleventh day before the Calends of August, in the fifth year after the Consulship of Paulinus Junior, a most distinguished man, in the second Indiction," *i.e.* July 22nd, 539, A.D.

l. 1. *Bonæ memoriæ.* Literally, "of good memory," *i.e.* worthy to be remembered for her virtues.

The duties discharged by females among the early Christians are noticed by heathen writers. Thus, Pliny, *Epist.* x., 96, says:—*necessarium credidi ex duabus ancillis, quæ ministræ dicebantur, quid esset veri et per tormenta quærere;* and Lucian, *De morte Peregrini,* 12:—ἕωθεν μὲν εὐθὺς ἦν ὁρᾶν παρὰ τῷ δεσμωτηρίῳ περιμένοντα γρᾴδια χήρας τινὰς καὶ παιδία ὀρφανὰ κ. τ. λ.

(To be Continued.)

SIR WILLIAM HAMILTON'S PHILOSOPHY: AN EXPOSITION AND CRITICISM.

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ARTICLE III.—*Criticism of Hamilton's System.*

In proceeding to the criticism of the philosophical system, of which the previous article in this series attempted an exposition, we are met by a number of doctrines which may be regarded as introductory; and accordingly to these, first of all, I request the attention of my readers.

The definition of philosophy, with which my exposition of Hamilton's system starts, might furnish matter for some observations at the outset, were it worth while that we should be thus detained from more important subjects: but in truth, as Hamilton himself remarks, the definition of philosophy "is the result of a lofty generalisation from particulars;"* and, therefore, the full discussion of such a definition might lead us prematurely into some of the problems which must afterwards demand consideration. The remark, which has been quoted in reference to the definition of philosophy, Hamilton applies also to its divisions; and, it appears to me, with even greater propriety: for the success of a science in the arrangement of its various departments must depend on the success with which it has investigated the distinctive nature of the various objects that constitute its province. While, however, a science may be in so crude a condition, as to leave room for doubt what place in a natural classification ought to be assigned to the various phenomena within its sphere, it is necessary to attempt some arrangement of these, were it merely for the purpose of guiding research. For such a purpose Sir William Hamilton's division of the philosophical sciences may be accepted; and every division of these ought, in the present state of philosophical inquiry, to be regarded as subject to the revision which may be rendered necessary by the researches it has served to guide.

The main efforts of Sir William Hamilton's power have been spent on the department which forms, in his classification, the first division of the philosophical sciences,——Empirical or Phenomenal Psychology; but even of this department he has by no means treated exhaustively all the subdivisions which he indicates. The third class of mental phenomena, for example, he enumerates merely incidentally in order to point out the different kinds of feeling which they originate; and although he not only discusses at considerable length the general theory of the feelings, but enters with some detail into the illustration of that theory, yet it is evident that the six lectures, which he devotes to the subject, cannot be regarded as much more than a mere sketch. It is, therefore, the science of knowledge that occupies by far the most extensive portion of Sir William Hamilton's writings, though of this science itself his discussion on several sections is found to be very unfinished even when we have with difficulty and perplexity collated all the references scattered throughout his different works. It is not, however, to be overlooked that, while confining himself chiefly to the science of knowledge, he has yet, at least, indicated the principles on which he attempts to solve the most important problems in the science of being.

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* *Lectures on Metaphysics*, Vol I., p. 44.

As introductory to Phenomenal Psychology, Sir William Hamilton discusses, in its most essential aspects, the universal condition of psychological phenomena, consciousness; and in his doctrine of consciousness are already implied the principles on which he founds the most important positions in his theories of knowledge and of existence. It is to the consideration of this doctrine that the present article will be limited.

At the outset it is necessary to notice the connection in which the subject of consciousness is introduced by Sir William Hamilton. In proceeding to classify the mental phenomena, he observes:—"These are *all* seen to comprise one *essential* element, or to be possible only under one *necessary* condition. This element or condition is consciousness."*

Now, it is impossible in this connection not to notice the fact that, in spite of the statement now quoted, Sir William holds, not only that there are states of mind without this element or condition, but that *all* states of mind, even after a consciousness of them has ceased, still continue to exist. The contradiction between these two positions must be admitted to be apparent, if it is not real; and it has not only been pointed out by Mr. Mill, in his *Examination of Hamilton's Philosophy*,† but it had been brought before the attention of Hamilton himself by some of his own students long ago. Mr. Mill, indeed, regards this as one of numerous contradictions, which Hamilton had failed to discover between his different opinions; and he founds his charge of inconsistency in the present instance on the fact, that the doctrine of latent mental states conflicts with several isolated expressions in Hamilton's writings tantamount to that which I have quoted above. I am not prepared to assert, that Sir William was himself unaware of the appearance of antagonism between the doctrines which are thus placed in opposition, nor do I think such antagonism can be proved to be real from the impossibility of reconciling separate statements made with different ends in view. It seems to me impossible to relieve Hamilton from the charge of not having sufficiently guarded these different statements, but in his expressions with regard to consciousness, as the condition under which alone the mental phenomena are realized, there is a certain caution which induces me to believe that he was consciously endeavouring to avoid any interference with his doctrine of latent mental states.

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* *Lect. on Metaph.*, Vol. I., p. 182.

† See Chapter XV.

It is but fair, in interpreting an author's doctrine on any subject, not to press too stringently incidental allusions to it introduced in the course of a discussion on something else, but we may justly hold him bound by the expressions he employs, when his main object is to state the doctrine in question. Now, in the passage which I have quoted from the *Lectures on Metaphysics,* undoubtedly it was Hamilton's design to point out a general characteristic by which the phenomena of mind are distinguished; yet he takes care to limit his statement to the *phenomena* of mind as such, and seems purposely to avoid extending it to all mental states. "In this knowledge they (the phenomena of mind,) *appear*, or are realized *as phenomena*, and with this knowledge they likewise *disappear*, or have no longer a *phenomenal* existence." It is apparently with the same intention that he qualifies a statement in the posthumous note on consciousness, appended to his edition of Reid's Works. "Consciousness is to be regarded as a general expression, for the primary and fundamental condition of all the energies and affections of our minds, *inasmuch as these are known to exist.*"* If this interpretation of these passages be correct, it must be supposed that Hamilton held consciousness to be the condition of mental states only in so far as these are phenomena or manifestations of mind, but that this condition does not preclude the existence of states which, as they do not manifest themselves, are beyond the sphere of consciousness.

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* See p. 929.

There is, however, an objection to this interpretation, and it is with a view to this objection that I have drawn attention to the connection in which Hamilton introduces the subject of consciousness into his lectures. He introduces it as a subject that must be considered before entering on an account of the several species of mental phenomena; and the reason which he assigns for this is, that all these different species are contained under consciousness as their genus. Now, the classification of mental phenomena, which he describes in this connection, undoubtedly contemplates these as states of mind in general, without any limitation whatever; and it seems at times as if, in making consciousness the "one essential element," the "one necessary condition" of these phenomena, he meant it to be regarded as the differentiating characteristic by which, not some modifications of the mind are distinguished from others, but all are distinguished from the modifications of matter. I ground this remark, not so much upon the two isolated statements adduced by Mr. Mill, as upon passages where it must be supposed that Sir William was on his guard in his mode of expressing this doctrine. The sentence, which I quoted above from the posthumous note on consciousness, is immediately followed by another which is connected with it as its reason by the word *for*, and which runs thus: "While knowledge, feeling and desire, in all their various modifications, can only exist as the knowledge, feeling and desire of some determined subject, and as this subject can only know, feel and desire inasmuch as he is conscious that he knows, feels and desires, it is therefore manifest that *all* the actions and passions of the intellectual self involve consciousness *as their generic and essential quality*." Similarly in combating Reid's doctrine, that consciousness is a special faculty of knowledge distinguished from the other special faculties as they are from each other, he observes: "Consciousness, consequently, is not one of the special modes into which our mental activity may be resolved, but the fundamental form,——the generic condition of them all." * Notwithstanding these statements he maintains "that the sphere of our conscious modifications is only a small circle in the centre of a far wider sphere of action and passion, of which we are only conscious through its effects." † This position may admit of being reconciled with the two other statements, but the reconciliation must be one which I am unable to conceive. These statements are not passing allusions which it might have been thought unnecessary to qualify with exact limitations; they are selected from passages which are intended as expositions of the doctrine regarding the relation of consciousness to the various forms of mental activity. If anywhere, it must be in such passages that we are to look for a statement on the subject, with all the necessary limitations; yet we find no limitation whatever to the assertion that mental action or passion without consciousness is impossible. It is, therefore, difficult to explain the qualifications which I have noticed as intended to limit the sphere of consciousness to certain states of mind considered as phenomena or manifestations; and this difficulty is increased by the consideration, that the statements containing these qualifications would, on such an interpretation, reduce themselves to the unimportant proposition, that consciousness is the necessary condition of those mental states of which, as phenomena, we are conscious.

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* *Discussions*, p. 48.

† *Lect. on Metaph.*, Vol. I. p. 349.

At the very starting point of Hamilton's philosophy we are thus brought face to face with a dilemma which spreads a much wider perplexity than may at first sight appear. For (1) if consciousness is the essential quality by which states of mind may be distinguished from those of matter, what is to be understood by certain states which are described as being destitute of this quality and yet as mental? and (2) if there may be states of mind without consciousness, what is the quality that forms the difference between a mental fact and a physical? The former alternative of this dilemma is one which will turn up again in the criticism of Hamilton's doctrine of latent mental modifications; I confine myself at present to the point involved in the latter alternative, that, in consequence of explaining certain facts beyond the sphere of consciousness by the agency of mind, he has left us in doubt as to the property by which mental and physical facts are to be distinguished from one another. In treating of psychology as a distinct branch of science it is implied that he recognised the facts, which are investigated in that science, as forming a group by themselves, distinguished by some characteristic from all other facts within our experience; but what, in Hamilton's opinion, that characteristic is, I am unable to discover. It is certainly a serious deficiency in the exposition of a science, that the distinctive nature of the objects, with which the science is occupied, is left altogether unexplained. It may be impossible, indeed, definitely to state the estential property by which the class of phenomena, forming the objects of a science, are distinguished from all others. Life in general, physical as well as mental, is so many-sided, that it seems to elude all our efforts to fit its various phenomena into a single definition; and even if we accept consciousness as the distinctive quality of mental facts, that is itself, as Hamilton remarks and as we shall find immediately, incapable of being exactly defined. Still, it is possible to furnish some conceptions regarding the distinctive nature of the objects to which the several sciences are devoted; and it is sufficient, as it is essential, that such conceptions should be clear and accurate enough to give a definite direction to the labours of students. Had Sir W. Hamilton uniformly, as he seems to have at times, made consciousness the *differentia* of all mental action and passion, he would have avoided a perplexity which it is now difficult to remove. As this perplexity has arisen from his referring certain actions of the nervous system to an unconscious agency of the mind, the further consideration of our present subject may be deferred till we have discussed his explanation of those nervous actions.

Since Sir William Hamilton holds that consciousness is the indispensable condition, if not of all mental states, at least of all mental phenomena, we may now inquire what he understands by consciousness. It has been already observed in passing that he maintains consciousness to be incapable of definition in the strict sense of the word, inasmuch as there is no more elementary fact by means of which it could be rendered clearer; and in this he will probably be sustained by the most of philosophers. But while he considers consciousness to be incapable of definition, he holds that it may be philosophically analysed. By referring to my exposition of his system it will be found that his analysis yields the following three factors as required to constitute every act of consciousness: (1) A mind or subject which knows; (2) a modification of that mind; (3) a recognition or knowledge by the mind of the modification. At the first glance nothing may seem more distinct than this analysis; and in the writings of some philosophers, even after matured examination, it might be found incapable of being misunderstood. As it stands, however, it must be taken in connection with the rest of Sir William Hamilton's philosophy; and in this connection it suggests several questions which cannot be easily or satisfactorily answered.

Of the three elements enumerated in this analysis, the first two viz., a mind and a modification of that mind, are, as Hamilton, explains, the terms of a relation. That relation is a knowledge of the latter term by the former, and constitutes the third element in the analysis. Now, it is a principle, more than once adduced by Sir William under the technical formula, that the knowledge of correlative terms is one, or in other words, that the same act of knowledge, which apprehends one term of a relation, must of necessity apprehend the other also. It might, therefore, be supposed that, when he explains consciousness as a recognition by a mind of some modification of itself, he meant it to be understood that the mind recognizes itself along with the modification to which it is related by such recognition. This supposition might be confirmed by observing the illustrations which he uses to show what consciousness is. He draws attention to the fact that, when I know I must know that I know, when I feel I must know that I feel, when I desire I must know that I desire; and he explains that, while the various mental phenomena may be represented by the formulæ, *I know, I feel, I desire*, the consciousness of them may be represented by the formulæ, *I know that I know, I know that I feel, I know that I desire.* The most natural interpretation of this language would understand it as implying that, when I know feel, or desire, inasmuch as I must know that it is I who do know, feel or desire, I require to know *myself* in the same sense in which I know the action or state of knowing, feeling or desiring. Finally, it seems impossible to avoid this interpretation when an attempt is made to construe into its real meaning the expression, *a modification of the mind:* for when that expression is taken as representing not an abstraction of thought, but a fact of actual experience, it can be understood as denoting only *the mind modified;* and, therefore, the terms, *my knowledge, my feeling, my desire*, must be regarded as merely abstract modes of designating *me knowing, me feeling, me desiring.*

Irresistible as seems to be the conclusion, that the preceding paragraph merely states explicitly what is evidently implied in Hamilton's analysis of consciousness, there is no doctrine which he has taken more care to repudiate. There is, probably, nothing in his philosophy which he would regard as more essential to its distinctive character than the position, that we know not real existences, but only their phenomena, modifications, qualities, attributes, properties. This general doctrine forms so essential a part of his *Philosophy of the Conditioned*, that it is unnecessary to adduce any passages to justify the ascription of it to him; but it may be worth while in the present connection to cite a single statement, inasmuch as it contains a special application of the doctrine which will help us to understand his analysis of consciousness. "In so far," he says, "as mind is the the common name for the states of knowing, willing, feeling, desiring, etc., of which I am conscious, it is only the name for a certain series of connected phenomena or qualities, and, consequently, expresses only what is known. But in so far as it denotes that subject or substance in which the phenomena of knowing, willing, etc., inhere,—something behind or under these phenomena,—it expresses what, in itself or in its absolute existence, is unknown.. Thus mind and matter, as known or knowable, are only two different series of phenomena or qualities."*

Certainly Sir William Hamilton cannot be charged with any tendency towards Empiricism; yet it is impossible to read such a passage as the above without remembering that, to his greatest critic also, the mind, so far, at least, as it is known and probably so far as it exists, is but a "series of feelings." This is also, it will be observed, identical with the account of the mind, of which a brief notice was given in the first article of the present series as the doctrine of David Hume. There is, however, an essential difference between the theory of Hamilton and that of Hume and Mill. It is, therefore, necessary to explain this difference, in order to comprehend the exact purport of Hamilton's doctrine.

To both theories there belongs a common view of the original and essential nature of mental phenomena. To them, mental phenomena are not originally states in which a mind knows or is conscious of itself as acting or affected in particular modes; they are merely phenomena which, in accordance with their own laws, generate the idea of a real or illusory substance to which they belong. The point, at which the two theories diverge, is in their explanation of the mode in which this idea is generated. According to every empirical theory the idea is the growth of a more or less prolonged experience; and this general doctrine admits of manifold modifications in accordance with its account of the various steps in the process through which the idea rises to maturity. On the other hand, in the theory of Sir William

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* *Lect. on Metaph.*, Vol. I., p. 138.

Hamilton, as in that of Kant also, no mental phenomenon is possibl without a reference of it to a mind as its subject; so that, though there is never any consciousness of the self which is the subject of such a phenomenon, the idea of self flashes—a Pallas from the human brain—into a certain completeness of existence with the earliest dawn of mental life.

At this point, however, Hamilton's theory separates from Kant's, strikes in fact into an entirely novel path. There is a passage in his Lectures on Metaphysics,* in which Hamilton notices the three general facts, revealed in consciousness, of our Mental Existence or Substantiality, our Mental Unity or Individuality, and our Mental Identity or Personality. In this passage he refers briefly, but with the clear force of his concisest utterances, to Kant's theoretical doctrine, that, inasmuch as the belief in our Individuality and Identity is merely a condition of the possibility of consciousness, it is impossible to conclude that that belief reveals to us a reality. The general discussion on this subject, but especially the reference to Kant, I am unable to understand except on the supposition that Hamilton did not always keep in view the applications of his own philosophy in this direction. "In disputing the testimony of consciousness to our mental unity and substantiality," he says, "Kant disputes the possibility of philosophy and consequently reduces his own attempts at philosophising to an absurdity." But how does Hamilton himself treat the testimony of consciousness to our mental unity and substantiality? According to the explanation, which undoubtedly represents his maturest speculations and which is alone consistent with the most essential principles of his philosophy, the belief in a mind as the subject of mental phenomena is merely one of the mental necessities which draw their origin from the widely operating Law of the Conditioned. By referring again to the exposition in my previous article it will be found that this law is described as arising either from the relation of knowledge or from the relations of existence, and that the relations of existence are divided into two classes as being either intrinsic or extrinsic. The intrinsic relation is defined to be that which furnishes the subordinate form of the Law of the Conditioned, which is named the *Principle of Substance and Phenomenon.* This principle, Hamilton expressly states,† applies to mind as well as to matter; but like all forms of the general law under which it comes, as it arises from the limitation or impotence of the mind, it expresses merely a necessity of thought, not a necessity of things. It is evident that, on this theory, the compulsory reference, by our consciousness, of its changing phenomena to a mind as their permanent subject, is wholly inadmissible testimony to the real existence of such a subject. Now, there is undoubtedly a difference in the modes in which Hamilton and Kant severally explain, or rather explain away, this testimony of consciousness; but on what ground the former can justly complain of the latter for disputing the testimony as if he himself allowed it, one cannot very easily discover. It seems at times indeed as if the necessities of thought had been too strong in Hamilton's mind to yield before the attacks of his own philosophy of the Conditioned; and it is certainly difficult to read the passage, in which he discusses the existence, individuality and identity of the mind, without the conviction that, when he wrote it, he himself believed these facts to be revealed in trustworthy deliverances of our consciousness. He is not unwilling to speak of the belief in the existence or substantiality of the mind as an *intuition*: and, although he afterwards derives it from the Law of the Conditioned, he declares in the passage under consideration, that "it is a simple and ultimate fact of consciousness," which, as such, "cannot be deduced or demonstrated."†

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* Vol. I, pp. 371—5.

† *Discussions*, p. 605.

Returning to the analysis of consciousness we can now more clearly understand what it implies. In spite of the language just quoted the general drift of Hamilton's most essential doctrines compels us to conclude that, in describing consciousness as a relation between a mind and its modifications, in which the former recognises the latter, he did not mean it to be understood that the mind recognises itself at the same time.

In reviewing this analysis of consciousness it is impossible to overlook the fact of its inconsistency with principles not only allowed, but even inculcated strenuously by Hamilton himself. I have already, in this connection, directed attention to his use of the logical law, that the knowledge of correlative terms is one; but it is instructive to notice more exactly the recoil upon his own doctrine regarding consciousness of the argument in which he urges this law against the doctrine on the same subject attributed to Reid. The doctrine of

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† *Lect. on Metaph.*, Vol I., pp. 371–2.

Reid maintains that we are conscious of the operations of our minds, but not of the objects to which these operations are directed. An operation of the mind, Hamilton objects, is what it is only in relation to the object which it apprehends; and consequently, since we cannot know one term in a relation to the exclusion of the other, it is impossible to be conscious of an operation of the mind without being conscious of its object. In like manner, when Hamilton teaches that, in the relation of a mind to its modifications which constitutes consciousness, there is a knowledge of the modifications, but not of the mind, may we not object that, as the mind and its modifications are the two terms of a relation, it is impossible to be conscious of the latter without being conscious of the former?

A further ground of objection to Hamilton's doctrine has already been indicated in the meaning of the word, *modification*. A modification or mode of anything, he explains, is merely a particular manner in which it exists or acts; and this is the radical idea which with some subordinate varieties of meaning he finds embodied in the various terms, *state, quality, attribute, property, accident, phenomenon.** Now, the manner or form of anything may undoubtedly, and for scientific purposes must frequently, be separated in thought from the thing itself, and contemplated and reasoned about apart; but no one dreams that manners or forms have any existence by themselves. To adduce Hamilton's own words in illustration, "thought," he says in a resumé of one of his Lectures on Logic, "thought, I showed, could be viewed, by an analytic abstraction, on two sides or phases. We could either consider the object thought or the manner of thinking it, in other words, we could scientifically distinguish from each other the matter and the form of thought. Not that the matter and form have any separate existence; no object being cogitable except under some form of thought, and no form of thought having any existence except some object be thought under it."† "This," he goes on to explain, "is merely one of a thousand similar abstractions we are in the habit of making;" and undoubtedly he would admit the distinction of a modification and a thing modified to be merely one of such scientific abstractions, not a real separation. It is true then that, in abstract or scientific speculation, I may contemplate my knowledges, feelings and desires without attending to *myself* who know, feel and desire, as it is also possible, in such speculation, to contemplate *myself* without attending to any of those states in one or other of which I must exist when I am conscious of myself. In actual life however I am conscious of my affections and actions not as abstract conceptions, but as concrete facts, and the statement that I am conscious of my affections and actions as such, can have no other intelligible meaning than that I am conscious of myself as affected or as acting.

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* *Lect. on Metaph.*, sect. VIII.

† *Lect. on Logic*, Vol. I., p. 21. See also p. 15.

In these suggestions I have by no means been seeking merely to drive an *argumentum ad hominem*, or to draw, by a mere play on the meanings of words or the relations of abstract notions, conclusions which have no value beyond abstractions, because incapable of being verified by observed facts. On the contrary, I believe that the facts revealed by the most accurate observation of mental phenomena will not for a moment tolerate a theory which implies that I am conscious of knowing and feeling, but that I am not conscious of myself who know and feel. What I am in reality who thus know myself in all that I am and do, is a question which belongs of course to the science of being, and will meet us therefore again at a subsequent stage of this criticism. In reference to the self, considered as a factor of consciousness, there are several other questions which might be discussed here appropriately enough, even though not directly suggested by Hamilton's analysis of consciousness, but as the most important of these must re-appear for consideration in other connections, and especially in connection with the knowledge of the not-self, their discussion may for the present be postponed.

The subject, which naturally presents itself next for our consideration, is the evidence and authority of consciousness. In connection with this, consciousness is to be considered first of all as the witness whose testimony reveals to us the phenomena of the mind. If Phenomenal Psychology is the science conversant about mental phenomena, and if consciousness is a knowledge of these phenomena without which they cannot exist, then clearly it is to consciousness that we must resort for an acquaintance with the objects of the science. This is the doctrine of Sir William Hamilton; but in maintaining it he placed himself unavoidably in conflict with phrenology and with those positivists who degrade psychology from the rank of an independent science to that of a mere branch of cerebral physiology. It is now our duty to inquire into the success of his polemic. In doing so a special care is required lest we lose sight of the rea questional issue; for there are certain positions of phrenology which must be canvassed on entirely independent ground without reference to the claims of any other science, while there are others which constitute phrenology a rival to psychology. The theories which it maintained or still maintains regarding the functions of different portions of the encephalon, its allegations regarding the development of the encephalon or of its different portions in different animals and at different ages, these are matters of purely physiological interest, at least they can affect only in an indirect manner the interests of any other science. When however it is asserted that the study of the brain supplies the exclusively reliable or even the principal information concerning mental phenomena, a doctrine is maintained which comes into direct collision with the claims of psychology. This doctrine the psychologist, studying mental phenomena by reflection upon consciousness, cannot choose but combat; with any other aspect of phrenology he has nothing necessarily to do.

Observing this distinction we are prepared to estimate more intelligently the mode in which Sir William Hamilton assails the pretensions of phrenology. Convinced that the doctrine of Gall, if true, "would not only afford a new instrument" tor investigating mental phenomena, "but would in a great measure supersede the old,"* he made extensive observations with a view to test the principal facts on which that doctrine professes to be based, and the results, he states, "prove that no assistance is afforded to Mental Philosophy by an examination of the Nervous System."† His aim, it is thus evident, was to show that the science of mind must be founded upon a study of consciousness, and that not only can it not be wholly constructed, but it cannot even receive aid from a study of the brain. The proof, however, which he leads from his wide induction, seems to me quite irrelevant to this point. It is far from my intention, and it would be extremely futile in me, even if it were just, to disparage the value to science of the researches conducted by Sir William Hamilton with the purpose now under consideration. It is for the physiologist, or rather for the historian of physiology, to estimate the assistance which these researches have rendered in the solution of previously unsettled problems. I notice that his observations on the average size of the

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* *Lect. on Metaph.*, Vol I., p. 406.
† Ibid., p. 264, note.

African brain, when compared with the European, are still supported by recent inquirers;* and, not to go further into detail, the discoveries which he claims to have made, regarding the development of the cerebellum in proportion to the cerebrum, must be acknowledged to be of value in determining the function of the cerebellum as well as in other respects. But it might be admitted that he had succeeded in overturning every doctrine of importance in the organology of the phrenologists; and yet we should be far from his conclusion that the study of the nervous system cannot supersede reflection in the science of mind, still farther from the position, that that science cannot even be aided by such a study. For the general theory, which makes mental science altogether dependent on the physiology of the nervous system, is not involved in the truth or falsity of particular theories on the special functions of different parts of that system. It is therefore incumbent on the psychologist to adduce some grounds, apart from any properly physiological doctrines, to prove that consciousness, if not the only competent informer, is certainly an independent source of reliable information, with regard to mental phenomena. Yet this is exactly what Sir William Hamilton has failed to do. As far as his arguments against phrenology are concerned, the general principle of that doctrine is unassailed and might therefore be reproduced with a revised theory of cerebral organs.

It is the more remarkable that Hamilton should have missed the exact point of this argument, because the basis of psychology, as opposed to any exclusive organology, is so obvious. It is possible to conceive, as a department of physiology, a science which seeks to discover the cerebral organs of different mental powers, which yet would not interfere with the investigation of these as they are revealed in our consciousness of their exercise. But Hamilton contemplated and attacked an intolerant doctrine like that of Comte, which refuses to recognise in consciousness any trustworthiness as a revealer of mental phenomena. Now, in opposing such a doctrine it is wholly unnecessary to consider the special functions which it may ascribe to the several parts of the brain. It is unnecessary even to rest content with the statement of Mr. Mill, that "all real knowledge of the successions of mental phenomena must continue, for a long time at least, if not for ever to be sought in the direct study of the successions themselves."* A much bolder assertion is justified by the facts of the case; for not only is it impossible to regard the phrenological method as the exclusively reliable way of obtaining information concerning the phenomena of mind, but it is evident that such a method by itself can discover nothing whatever of these phenomena. To make this evident it is not necessary to enter into the physiological questions discussed by Sir William Hamilton; it is necessary merely to consider what kind of knowledge alone can be furnished by an observation of cerebral structure and functions.

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* See the *Quarterly Journal of Science* for January, 1866, p. 46.

In this consideration I shall say nothing of the great imperfections which, in spite of the advances made even since the time of Hamilton, still continue attached to the physiology of the nervous system. Suppose this department of physiology and the corresponding department of anatomy were as perfect as they ever can be, what could they accomplish? They may furnish a minute acquaintance with the physical structure and with the chemical constituents of the brain and the nerves; they may succeed in generalising the physical or chemical laws of which nervous action presents a special form; they may thus bring the nerve-force into correlation and convertibility with the other forces of the material universe: but in all this what approach has been made to the discovery of one of those phenomena which are distinguished as mental? Absolutely, it must be answered, no approach whatever. For the phenomena of my mind—my thoughts, my feelings, my wishes—are all actions which *I* perform and am conscious of performing, or states in which *I* exist and am conscious of existing; whereas the phenomena revealed to me by observation of the brain are all actions performed by something that is not I, states in which something that is not I exists. Now, it is, indeed, impossible to prove the assertion, but to every one who reflects the assertion is self-evident, that *I*, as well as the actions which *I* perform and the states in which *I* exist, my thoughts, and feelings and wishes can be discovered only by *me*, that is, by a consciousness of myself, certainly cannot be discovered in anything that is not I. The evidence of this assertion may be made more pointed by the reflection, that all that can be discovered in the observation of the nervous system and its modes of action must be one or other of those phenomena which are capable of affecting the external senses; and, indeed, it is mainly to the knowledge conveyed through the eye that such observation sı limited. But what sense is constructed to receive impressions from the phenomena of mind? through what function of the eye can one see a thought or a wish? In putting this question it is not denied that there is a special portion of the brain or a special action of its fibres on which self-consciousness depends; and that, therefore, self-consciousness may have in the nervous system an organ which, by analogy with the organs of other mental acts, might be named a *sense*. While, however, the existence of such an organ is still a mere hypothesis suggested by the general correlations of mental and nervous actions, it is not by such an organ that observations are made upon the brain: and even if such an organ were discovered, the discovery could afford no assistance towards ascertaining the peculiar nature of those phenomena of which it is the organ. On the other hand, these phenomena,—the actions which I perform, the states in which I exist,—never occur without that knowledge of them which is commonly named consciousness; and without this knowledge it would be as impossible to conceive their peculiar nature as it is for the congenitally blind to form any conception of colour.

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* *Logic*, VI, 4, 1. The statement is homologated by Mr. Lewes in his *Comte's Philosophy of the Sciences*, p. 210.

It is, therefore, evident that, without entrenching on the peculiar ground of physiology, the psychological method of studying mental science may be easily vindicated in opposition to an intolerant organology; but it still remains a question, what place in that science is to be assigned to the science which investigates the organ of mind? The doctrine of Sir William Hamilton, as we have seen, in its opposition to phrenology, goes to the extreme of maintaining, "that no assistance is afforded to Mental Philsophy by an examination of the Nervous System." There is, however, an *a priori* improbability in such a doctrine. The general connection of the sciences, which every year is rendering more extensive and more intimate, makes Hamilton's assertion, in its absoluteness, untenable; but it is specially unlikely that two sciences, so closely related as the philosophy of the mind and the physiology of the nervous system, should be of no assistance to one another; and it would not be difficult to show that there must be between them a mutual and beneficial reaction. It is altogether impossible, for example, to analyse so complex a phenomenon as any one act of sense-perception into its constituent elements so as to extricate the purely mental without ascertainining the nervous processes by which they have been conditioned; and the determination of many still unsolved problems regarding sensation is to be sought as much from physiology as from psychology. I shall say nothing of the assistance which physiology has rendered in narrowing down the controversy regarding the origin of the different factors which constitute human knowledge, nor need I indicate the light which it may throw on many peculiarities among the phenomena of human consciousness. Sir William Hamilton himself, by his numerous interesting notes on the physiology of the nerves, has shown the psychological importance of this study; and in subsequent parts of this criticism we may have an opportunity of noticing the explanation of several phenomena which is furnished by attention to the laws of nervous action.

Although, therefore, the value of physiology in mental science may be too highly exalted, it is not legitimate to despise its contributions altogether. Its relation to psychology is in fact that of several other sciences whose borders at points unavoidably overlap those of the science of human nature. The science of language, to take an obvious instance, is growing every day into an importance which must be more fully accorded to it as a handmaid to the science of mind; for in the words which, expressing the most familiar and indispensable ideas, are to be found in all languages, in the nominal and verbal inflections of different tongues, in the manifold grammatical and lexical changes which human speech is everywhere undergoing, there is undoubtedly preserved a record of processes through which the human mind has been developed in pre-historic as well as in historic times, and by a more accurate and extensive study of this record we may be more easily and surely guided to the laws by which the mental development of mankind is regulated. I see no improbability in the prospect of attempts, as definite as those which have been made in favour of physiology, to supersede psychology by comparative philology. It is unnecessary, in further illustration of this subject, to do more than draw attention to the fact, that the most valuable assistance may also be rendered to the science of mind by the general history of the human race as well as by the special history of different departments of human activity, by the natural history of mankind and by those statistics of modern society, the accurate collation of which has become one of the most interesting studies among the facts of human life.

In connection with the evidence and authority of consciousness we have still to consider Hamilton's doctrine regarding the basis and starting point of philosophy. The phenomena, which philosophy investigates, are, we have seen, discoverable only by consciousness: it is consequently on the facts revealed in consciousness that philosophy must be based; and in order that this basis should be secure consciousness must be a revealer of facts, not of illusions. In all this Sir William Hamilton will undoubtedly be followed with assent by those who have sought the ultimate foundation of our beliefs; but it is necessary to observe a distinction, which he draws, between two different aspects in which the testimony of consciousness may be viewed. In the first place consciousness may be regarded as bearing witness to its own existence; but it may also in a second aspect be considered as testifying with regard to facts beyond itself. Now, he maintains, it is impossible to question the testimony of consciousness in the former aspect; I cannot doubt that I am conscious wihout doubting and thus annihilating my doubt, since it must be a state of consciousness: but in the latter aspect the testimony of consciousness may, without contradiction, be doubted, though such a doubt, by surrendering the veracity of consciousness, would remove the foundation of philosophy. It appears to me, however, that Sir William Hamilton has not contemplated all the points of view from which the testimony of consciousness may be regarded. It is possible, I think, to ask three questions with regard to that testimony: (1) Is there such a fact as consciousness, am I really conscious at all? (2) Admitting that I am conscious, what is it I am conscious of? in other words admitting the existence of consciousness, what is the fact to which it testifies? (3) Suppose I know the fact to which consciousness testifies, is its testimony trustworthy? Now I am unable to explain Hamilton's application of the twofold distinction which he draws except on the supposition that he has failed to discriminate the first two of the three questions which I have now stated. His remarks on the former of the two aspects in which he contemplates the testimony of consciousness are true only in reference to the first of the three questions which I have distinguished; but he frequently urges his remarks, especially against an antagonist, as if they were true in reference to the second of these questions. For instance, to illustrate his distinction he takes the phenomenon of external perception, in which, he maintains, the fact declared by consciousness is that I have an immediate knowledge of a non-ego. "Of this," he argues, "*as a phenomenon,* doubt is impossible. For, as has been seen, we cannot doubt the actuality of a fact of consciousness without doubting, that is subverting our doubt itself."* Now, in an act of perception, as in any other act, it is certainly impossible to doubt the fact that I am conscious of something; but what that something is of which I am conscious, is not in the same category of indubitable certainty at all. On the contrary I believe that not only in the case of external perception, but very frequently also in regard to other states of consciousness the point most difficult of determination is precisely the fact which consciousness really attests. This is a difficulty which is met not only in reflecting on the phenomena of mind, but also in observing the phenomena of matter; and Hamilton himself inculcates the caution which the difficulty renders necessary. In explaining the conditions of a legitimate hypothesis he lays down as the very first, that the phenomena, which the hypothesis explains, should be ascertained actually to exist; and lest the condition should appear too elementary to be worthy of statement, he warns his students that the necessity of the admonition is shown by "great and numerous examples of its violation in the history of science," quoting with approbation the remark of Cullen, "that there are more false facts current in the world than false hypotheses to explain them."† While the observation of physical phenomena is not unattended with risks that require the observer to guard himself by numerous precautionary measures, the difficulty of making exact observations so as to distinguish facts from mere illusory appearances Hamilton himself describes as immeasurably increased in seeking to detect the phenomena of consciousness. It is indeed one of his charges against the hypothesis of representative perception, that it fails to fulfil the above-mentioned condition of a legitimate hypothesis;‡ and not the least frequent criticism which he passes on theories opposed to his own is to the effect, that they mis-state the facts to be explained in order to suit their explanation. I hold therefore that a principle, not only prejudicial to science, but opposed to the explicit teaching of Hamilton himself, would be introduced by the doctrine, that it is impossible for any one to doubt what, at any conscious moment, the fact is, to which consciousness actually testifies and in which accordingly its veracity is involved. It is not therefore legitimate in Sir William Hamilton to assert that the fact of consciousness, as interpreted by him, in an act of perception, is beyond all scepticism; for we shall find when we advance to the consideration of this subject, that such scepticism is expressed by authorities who are perfectly competent to give their version of the fact attested by consciousness. Were it necessary to illustrate further the uncertainty that arises in ascertaining the testimony of consciousness, another appropriate example presents itself in connection with Hamilton's doctrine of the causal judgment. In that judgment, as observed by him, the fact attested by consciousness is merely the impotence of the mind to conceive that a phenomenon, now appearing, was formerly non-existent, and the consequent necessitation of the mind to conceive the phenomenon as having previously existed in other forms. I should say, that probably not one of a hundred observers, on turning their attention to this subject, would accept such a statement as expressing the fact of which they are conscious when they judge that a certain phenomenon must have had a cause. Yet "there is in truth nothing," says Hamilton, "which men seem to admit so lightly as an asserted fact."* How many of his disciples have admitted his interpretation of the fact implied in the causal judgment merely because it is asserted by him?

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* *Reid's Works*, p. 744. The itali are his own.

† *Lect. on Metaph.*, Vol. I., p. 169

‡ *Ibid.*, Vol. II. p. 138.

Both Mr. Mill† and Professor Bain‡ have insisted on the difficulty, which I have now illustrated, of discovering the exact facts attested by consciousness; and their remarks are well worthy of study. They do not however point out the source of Hamilton's mistake, which, as I have indicated, is to be found in his confusion of two very different questions under one question of ambiguous import. His error is thus to be explained as a *Fallacia Plurium Interrogationum.* To use his own illustration, he might be regarded as saying to the defender of representative perception, "Do you admit the fact of consciousness in an act of external perception?" "Certainly," will be the answer, "the fact of consciousness cannot be doubted." "Then you must admit the reality of the fact, or you deny the truthfulness of consciousness and destroy the possibility of philosophy." "Hold!" the representationist may justly reply, "I admitted the fact of consciousness, meaning the fact that I am conscious; for that cannot be doubted: but I do not admit the fact of consciousness, if you mean the fact of which you say that I am conscious; *that* is by no means beyond scepticism."

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* *Lect. on Metaph.*, Vol. I., p. 169.

† *Exam. of Hamilton*, p. 502, 1st ed.

‡ *Emotions and Will*, pp. 513–9, 2nd ed.

It would certainly be a point of some importance in the interpretation of Hamilton's system, if we could be assured that he placed the foundation of philosophy in the fact of consciousness, that is, in the fact that consciousness exists. It is undeniable by those who have carried their inquiries back to the primitive chaos which the light of human thought has irradiated with its order, that after all, even the oldest, beliefs have slipped from under their feet and they are stepping timidly on the pathless waste of universal doubt, there remains in the doubt itself one fact which no doubt can remove; and that is the fact of consciousness. It is scarcely possible that this truth can ever be more clearly or more beautifully expressed than in the *Meditations* of Descartes, whose *Cogito, I am conscious,* undoubtedly embodies the ultimate resting-point as well as the primal starting-point of all human belief, even though it may not be admitted that the first step in advance from that point is *Sum, I exist,* without an explanation of what both "I" and "exist" imply. But it is far from certain that Sir William Hamilton perceived this fact to be the sole basis of philosophy, because he confounds it with another fact which is by no means on a par with it in absolute certainty. We find ourselves met by a similar difficulty in attempting to define the next stage in the upbuilding of Hamilton's philosophy. While he maintains that it is impossible to doubt a deliverance of consciousness as a testimony to the fact of its own actuality, it is possible, he admits, to question the truthfulness of its testimony to anything beyond that fact. When the question therefore is asked, on what ground the deliverances of consciousness are to be accepted as truthful, the most natural answer we should have expected from Hamilton, according to his own principles, would be, that these deliverances carry their evidence in themselves, that, while they form the proofs of other things, they cannot be proved by anything more evident; and I am inclined to believe that this was really his opinion. But after a careful comparison of various passages in which he treats of the subject one can scarcely believe that he was perfectly or at least uniformly clear in his own mind on the point. It is especially perplexing to find occasionally something like an attempt to prove the veracity of consciousness by arguments, such as the consideration that, if consciousness were mendacious, God would be a deceiver and the root of our nature a lie. That this or any other argument must ultimately appeal to one or other of the self-evident deliverances of consciousness is, however, so obvious, that it may be supposed Hamilton did not in such considerations really intend to prove the veracity of consciousness, but rather to illustrate the necessity of admitting it by indicating the consequences implied in its denial.

The length, to which this article has extended, has allowed me merely to touch on this last subject. I am compelled also, for the same reason, to omit any reference to the rules, laid down by Hamilton, for applying the testimony of consciousness or to his claim of originality in their discovery.

ON THE AXES OF A CONIC IN TRILINEARS.

In vol. IX., No. 52, and vol. X, No. 59 of this Journal, were given some descriptions of particular cases of the trilinear equation to a conic. In the corresponding discussion of the general equation, it does not appear to have been noticed that the axes can be determined by the very same process as that used by Sir W. Thomson to obtain the principal radii of curvature at a point in a surface, the resulting equation differing only in the forms of the constants. This omission has been caused, I believe, by the systematic neglect of the relation (2) of this article, which was demonstrated and employed in the articles above referred to. I proceed to the general investigation.

Let the conic

$\phi(\alpha, \beta, \gamma) = u\alpha^2 + v\beta^2 + w\gamma^2 + 2u'\beta\gamma + 2v'\gamma\alpha + 2w'\alpha\beta = 0.$

be cut by the diameter

$$\frac{\alpha - f}{l} = \frac{\beta - g}{m} = \frac{\gamma - h}{n} = r,$$

where the point (f, g, h) is the centre, r is the distance between (α, β, γ) and (f, g, h), and $l, m, n,$ are subject to the conditions

$$al + bm + cn = 0, \qquad\ldots\ldots(1)$$

$$l^2 \sin 2A + m^2 \sin 2B + n^2 \sin 2C = 2 \sin A \sin B \sin C \qquad\ldots\ldots(2).$$

Then the two values of r are given by the equation

$$\phi(l, m, n)\, r^2 + \phi(f, g, h) = 0,$$

or, writing

$$-P \text{ for } \phi(f, g, h),$$

$$\frac{P}{r^2} = ul^2 + vm^2 + wn^2 + 2u'mn + 2v'nl + 2w'lm.$$

The products, mn ...... can be eliminated from this expression by aid of condition (1); thus

$$al + bm = -cn$$

and therefore

$$2ablm = c^2n^2 - a^2l^2 - b^2m^2.$$

Hence, making

$$H = u + \frac{a}{bc}(au' - bv' - cw'),$$

$$K = v + \frac{b}{ca}(bv' - cw' - au'),$$

$$L = w + \frac{c}{ab}(cw' - au' - bv'),$$

the above expression becomes

$$\frac{P}{r^2} = Hl^2 + Km^2 + Ln^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

To determine the axes, r is to be made a maximum or minimum by the variation of l, m, n, subject to the relations (1), (2); hence,

$$0 = Hldl + Kmdm + Lndn$$

$$0 = adl + bdm + cdn$$

$$0 = \sin 2A.\, ldl + \sin 2B.\, mdm + \sin 2C.\, ndn,$$

and using indeterminate multipliers λ, μ, we obtain

$$Hl + \lambda a + \mu \sin 2A.\, l = 0 \ \ldots\ldots\ldots\ldots (4)$$

$$Km + \lambda b + \mu \sin 2B.\, m = 0 \ \ldots\ldots\ldots\ldots (5)$$

$$Ln + \lambda c + \mu \sin 2C.\, n = 0 \ \ldots\ldots\ldots\ldots (6)$$

Then, $l \times$ (4) $+ m \times$ (5) $+ n \times$ (6) gives

$$\frac{P}{r^2} + \mu\, 2 \sin A \sin B \sin C = 0.$$

Substituting this value of μ in (4), (5), (6), they become

$$l = \frac{-\lambda a}{H - \dfrac{\sin 2A}{2 \sin A \sin B \sin C} \cdot \dfrac{P}{r^2}}$$

$$m = anal$$

$$n = \ldots\ldots$$

and multiplying these respectively by a, b, c, and adding,

$$\frac{a^2}{H - \frac{\sin 2A}{2\sin A \sin B \sin C} \cdot \frac{P}{r^2}} + anal + \ldots\ldots = 0$$

or by an obvious reduction

$$\frac{\tan A}{2\sin A \sin B \sin C \cdot \frac{H}{\sin 2A} - \frac{P}{r^2}} + anal + \ldots = 0, \ldots\ldots\ldots(7)$$

a quadratic in r^2 which gives the squares of the semi-axes.

To determine P, we have, since (f, g, h) is the centre,

$$\frac{\phi'(f)}{a} = \frac{\phi'(g)}{b} = \frac{\phi'(h)}{c}$$

$$= \frac{f\phi'(f) + g\phi'(g) + h\phi'(h)}{af + bg + ch}$$

$$= \frac{2\,\phi(f, g, h)}{2\,\Delta} = \frac{-P}{\Delta},$$

Hence P is found by eliminating f, g, h from the equations

$$\phi'(f) + \frac{aP}{\Delta} = 0,$$

$$\phi'(g) + \frac{bP}{\Delta} = 0,$$

$$\phi'(h) + \frac{cP}{\Delta} = 0,$$

together with $af + bg + ch = 2\Delta$;

and therefore P is given by the determinant

$$\begin{vmatrix} u, & w', & v', & \frac{aP}{2\Delta} \\ w', & v, & u', & \frac{bP}{2\Delta} \\ v', & u', & w, & \frac{cP}{2\Delta} \\ a, & b, & c & -2\Delta \end{vmatrix} = 0, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

or if we expand the determinant

$$P = (2\Delta)^2 \frac{uu'^2 + vv'^2 \div ww'^2 - uvw - 2u'v'w'}{a^2(vw - u'^2) + anal + \ldots + 2bc\,(v'w' - uu') + anal + \ldots}$$

On clearing the equation (7) of fractional forms, it will be found to reduce to

$$\frac{P^2}{r^4} - \frac{P}{r^2}(H+K+L) + (KL\sin^2 A + LM\sin^2 B + MN\sin^2 C) = 0, \quad\ldots\ldots\ldots\ldots \quad (9)$$

which is probably the most simple shape it can assume.

Cor. Hence we have at once the conditions that the curve may be an ellipse, parabola, or hyperbola respectively,

$$KL\sin{}^2 A + anal + \ldots \begin{smallmatrix} > \\ = \\ < \end{smallmatrix} 0.$$

Again, since, if r_1, r_2 are the values of r,

$$\frac{1}{r_1^2\, r_2^2} = \frac{KL\sin^2 A + anal + \ldots}{P^2},$$

the area of the curve when it is an ellipse is

$$\frac{\pi P}{(KL\sin^2 A + anal + \ldots\ldots)^{\frac{1}{2}}}.$$

The condition that it may represent an equilateral hyperbola is

$$H + K + L = 0.$$

That it may represent a circle, it is plain that the roots of (7) are equal when the denominators of the fractions are the same; that is, when

$$\frac{H}{\sin 2A} = \frac{K}{\sin 2B} = \frac{L}{\sin 2C}$$

and these conditions are therefore sufficient, but it can easily be proved that these conditions are also necessary, by applying the condition of equal roots to the equation (9). Thus, this condition is

$$4\,(KL\sin^2 A + anal + \ldots\ldots) = (H + K + L)^2$$

or,

$$H^2 + K^2 + L^2 + 2\cos 2A.\,KL + 2\cos 2B.\,LH + 2\cos 2C.\,HK = 0.$$

which is easily seen to be equivalent to

$$(H\cos 2B + K\cos 2A + L)^2 + (H\sin 2B - K\sin 2A)^2 = 0,$$

which requires

$$\frac{H}{\sin 2A} = \frac{K}{\sin 2B} = \frac{L}{\sin 2C}.$$

That the conic may break up into two lines not parallel, the condition is, since the axes in this case vanish,

$$P = 0.$$

the direct interpretation of which is that the centre is a point on the curve; and the determinant (8) becomes

$$\begin{vmatrix} u, & w', & v' \\ w', & v, & u' \\ v', & u', & w \end{vmatrix} = 0.$$

If simultaneously with this condition, we have also

$$KL \sin^2 A + anal + \ldots\ldots = 0,$$

the curve breaks up into two parallel lines.

J. B. C.

Toronto, December, 1867.

MOLLUSCOUS ANIMALS.

NO 2.

BY REV. PROFESSOR HINCKS, F.L.S.

In my former paper on Molluscous animals I had to deal with a part of the subject where I might reasonably consider the materials for judging within my reach, and where I could maintain my opinions with some confidence. In proceeding to the subdivision of the several classes, I feel my task to be far more difficult and more uncertain in its results. It is true that in some of the classes orders have been proposed, and in the smaller classes the families answer the same purpose; but in some cases the attempts made, even by those whose authority is considered very high, are far from being satisfactory, and in others there can scarcely be said to have been any attempts made. A classification complete in all its steps is required for introducing students, most easily, to a knowledge of the structure and mutual relations of the creatures, and I have felt the need of it to such an extent as to be drawn to attempt something, whilst I feel that though I have very long interested myself greatly in this division of the Animal kingdom, my distance, for some years past, from the sea, from large collections, and from the most valuable books, throws great difficulties in my way, and prevents my feeling much confidence in what I have to offer. To begin with the class Tunicata, both the subclasses have been divided by good authorities into Orders, in each case, five in number, and seemingly well-founded, though the analogies usually perceptible between the divisions, corresponding in position, here escape my notice, and I do not even recognise, in the case of the lower sub-class *Polyzoa*, any reason for the particular series, which I accept as usually given. In the higher sub-class the divisions are no more than family groupes, though for our present purpose, equivalent to orders. In the Polyzoa they have more extent, and include more variety of form, but are less certainly established. They are as follows:

A. TUNICATA

SUB-CLASS Polyzoa.	SUB-CLASS Tunicata proper, or Ascidioidea.
1 Cheilostomata.	1 Ascididæ.
2 Cyclostomata.	2 Clavellinidæ.
3 Ctenostomata.	3 Pyrosomatidæ.
4 Pedicellinea.	4 Botryllidæ.
5 Hippocrepia.	5 Salpidæ.

I merely refer to this class to give as much completeness as possible to the view of the sub-kingdom whtch I submit to you: I am myself acquainted with it only from books and preserved specimens, most of them belonging to Polyzoa.

We proceed to class Conchifera: of its highly interesting lower sub class, Palliobranchiata, I can only say at present that the eight families, into which they are divided in the best recent works, seem to me to require some combinations. This will, of course, depend on our views as to the mode of limiting families, some founding them chiefly on a single structural character, whilst others require the concurrence of several characters to mark the type of the groupe, but admit of variability in one or more of these, so long as the organism appears to be nearer to a particular type than any other; some admitting a family wherever they observe a certain resemblance amongst a few genera, whilst others expect the principal families which, in a sub-class, might almost as well be called orders, to express certain tendencies of development in analogy with corresponding divisions of other classes, thus occupying a definite place in a general system. Perhaps we may be justified in treating *Craniadæ* and *Discinidæ* as in our sense one family with their hingeless oyster-like shells, and as exhibiting the lowest Palliobranchiate type, next to these would come the *Lingulidæ*, and I should be tempted, conjecturally, to include *Orthidæ* under *Productidæ*, and to unite *Spiriferidæ* and *Rhynconellidæ* with their unpunctate shells and spirally folded arms, usually more or less supported by a shelly prop, suitably bent for the purpose. The remaining family of *Terebratulidæ* may be received without question. It would be requisite before formally proposing such a modification of the classification, to examine carefully all that is known of the animals, or their shells, in a manner which my opportunities here do not admit. I can therefore, at present, only express my expectation that the five tendencies, usually manifested under each class, or sub-class, will be observed here, as elsewhere, and that corresponding truly natural divisions will thus be formed. The Palliobranchiata are most of them known to us in a fossil state. The few recent species assist us in rightly interpreting the appearances they present.

We advance to the consideration of the Lamellibranchiata, the higher sub-classes of Conchifera, and one of the most extensive and important divisions of the molluscous sub-kingdom. It is a division in which the families have been worked out with considerable success, though the distinction between the greater families and sub-families has not always been duly attended to, but the combination of the families into orders has been either neglected, or performed in a manner that is far from satisfactory. La Marck proposes two orders: Monomyaria and Dimyaria, founded on the number of muscular impressions on the shell. It is not to be doubted that the single muscle marks inferior development, and is a useful character in determining lower groupes; but it may be greatly doubted whether it is an absolute character, sufficient to limit an order, and marking in itself a grand division among Lamellibranchiate Mollusks. It would not be allowable to place *Tridacna* in a different order from *Chana*, on account of its blended sub-central muscular impressions, nor to remove *Mytilidæ* from the lowest order, and from the near neighbourhood of *Aviculidæ*, on account of the presence of two almost combined muscular impressions, nor is it by any means proved that *Arcadæ*, which in several particulars seem to belong to the lowest division, must be separated from it on account of their two muscular impressions: much less can it be maintained that the *Dimyaria* have not divisions among themseles, on other grounds quite as important as their distinction from *Monomyaria*, and therefore increasing the number of orders. Another proposed leading division of *Lamellibranchata* is into Asiphonida and Siphonida. This depends on the entire separation, or union in some part of their margins, of the mantle lobes, leaving distinct openings for the incurrent and excurrent water which is drawn in by the action of cilia, and after providing both for nutrition and aeration is expelled through the other orifice. It is to be remarked that this latter arrangement does not materially alter the nature of the processes performed, but is an adaptation of the common structure to the cases of living within sand or mud, or at some depth in it, the length of the siphons being adapted to the habit of the creature in this respect. It is nevertheless to be admitted that the simpler structure, where the water is directed in its proper course, though the mantle lobes and branchial lamellæ are entirely unconnected, is lower than the more complicated one, in which there is more or less coherence of these parts, and extension where required into elongated siphons: accordingly the differences in this respect may be assumed as valuable aids in classification, though here, as with all other characters, we meet with exceptions which might greatly embarrass us if we did not recognise them as deviative cases, necessarily belonging to a truly natural system. Who would remove *Dreissena* from *Mytilidæ* on account of its siphons? I have referred to the varying length of the siphons, and this has given occasion to another sectional distinction, much, and justly, valued since it has come into notice: I mean the distinction of all Lamellibranchiata into *Integropallialia* and *Sinupallialia*. The margin of the mantle-lobes leaves its impression on the shell. If there are no siphons, or short ones, the retraction of which within the shell does not disturb the position of the mantle lobes, the pallial impression will follow the curve of the margin of the shell all round, and is said to be entire, thus characterising the Integropallialia. If, on the other hand, the siphons are so much elongated that the muscular effort in their retraction draws back also a part of the mantle lobes, then the frequent repetition of this action will be marked in the pallial impression by a sinus, more or less deep, immediately behind the position of the siphons, in which case the shells are Sinupallialia. As we have here an index, in the appearance of the shell, to an important structural difference in the animals, the character is one of great utility. It would not, alone, distinguish orders, since it would not distinguish Asiphonida from Siphonida with short tubes, and a recognition of the importance of the length of the Siphons, implies that of their presence or absence, but combined with other characters, its great utility ought to be admitted. The form of the foot is undoubtedly a character of high importance, both because the varied development of this characteristic molluscan organ, might naturally be expected to yield valuable results, and because we can see the connection between its different conditions and different habits of life requiring it to be differently employed, as for the attachment of byssus, crawling, jumping, or boring, and when it is nearly abortive, we know the animal to be either fixed to his place, or enabled to move by swimming. Dr. J. E. Gray has divided the Lamellibranchiata into orders according to the nature of the the foot, but though deserving of much attention, it is very doubtful whether it marks progress of development as well as the characters which we have previously considered, and it has the practical disadvantage of not being observable without seeing the animal alive, or in a well preserved condition. The medium of respiration, whether fresh or salt water, is deserving of much attention, and the microscopic structure of the shells is of considerable importance, there being a manifest progress observable from the lower to the higher forms, the painted porcellanous form seeming to claim a higher position than the plainer solid form; that than the nacreous, and all of these above the succession of thin overlying plates. Other characters, as slight peculiarities in the branchiæ, position of the ligament, dentition of the hinge, &c., seem to be of so much less importance, that though they may be advantageously used for genera and families, they cannot be supposed to furnish distinctions of orders. It must nevertheless be observed that considerable reduction in the size of the shell-bearing portion of the mantle, accompanied by the habit of burrowing in stone, clay or wood, and frequently by the formation of a shelly tube to protect the Siphons, forms a series of characters marking the highest development in one direction, which has been used, to all appearance with great propriety, and which may be necessary to complete a natural series of orders from the data now obtained. These orders all arise naturally from principles which, for some time past, have been admitted by the best authorities, only requiring their proper combination to supply definitions which fulfil all the requirements for a good series of orders, or primary groupes, under the class. They are: Ord. I., Asiphonida: Mantlelobes, and branchial lamellæ unconnected, or nearly so; muscular impression generally single; foot usually either obsolete or byssiferous. Families beginning with the lowest—

1 Ostræidæ.
2 Mytilidæ.
3 Aviculidæ.
4 Pectinidæ.
5 Arcadæ.

Ord. II., Nayades.—Mantle margins united between the excurrent and incurrent orifices, and rarely in front of the latter; excurrent orifice plain, incurrent fringed; foot very large; branchial lamellæ united posteriorly to each other, and to the mantle; sexes distinct; inhabit fresh water or estuaries; shell generally nacreous within. Families—

1 Mulleridæ.
2 Ætheriadæ.
3 Anodontidæ.
4 Trigoniadæ.
5 Unionidæ.

Ord. III., Brachysiphonidæ.—Animal with Siphons, the mantle lobes being more or less united; Siphons short, pallial line simple.

Families: 1 Chamidæ, with sub-families { Chaminæ, Hippuritidinæ, Tridacninæ,
2 Lucinidæ.
3 Cardiidæ.
4 Cycladidæ.
5 Cyprinidæ.

Ord. IV., Macrosiphonida.—Animal with long retractile Siphons; Pallial line Sinuated.

Families: 1 Myadæ, including Anatinidæ auct.
2 Solenidæ.
3 Mactridæ.
4 Tellinidæ.
5 Veneridæ.

Ord. V. Inclusa.—Animals boring in stone, clay or wood, their long imperfectly retractile siphons sometimes inclosed in a shelly tube, to which the pair of shells is sometimes attached; shell incompletely covering the body, often hard and rasp-like, and with accessory pieces about the umbones.

Families not well determined—Gastrochænidæ and Pholadidæ are generally recognised.

I have not here attempted to give the characters of the families adopted, because they may be found in accessible books, except in the case of the Naïdes, where in giving them the importance of a distinct order, to which I think them well entitled, I have associated with them the little family of Trigoniadæ, agreeing with them in the large active foot, in the nacreous interior of the shell, and in having, as it appears to me, their curious hinge teeth, more related to those of Unionidæ than to any other form. I have also ranked as a family distinct from Unionidae, the shells without hinge teeth forming the genera Anodon and Mycetopus, with which Iridina must be associated, and I have taken Aetheria with its curious mode of attachment, and Mulleria with its Oyster-like mode of fixture and roughness of shell and its single adductor muscle, as types of families. I am well persuaded that besides Castalia there are several good genera capable of clear definition among the varied forms which constitute the immense genus Unio, my family Unionidæ.

(*To be Continued.*)

ILLUSTRATIONS OF THE GENUS CAREX.

We have great pleasure in making known to those of our members who are interested in Botanical pursuits a valuable addition to the library of the Canadian Institute, which we owe to the generosity of Mrs. Boott: the "Illustrations of the genus Carex" in 4 vols. folio, by her late husband, Dr. Francis Boott. We need not speak here of the extraordinary merit of this beautiful work on which its distinguished author laboured so long and earnestly; but as the cost of its accurate, and highly finished, figures unavoidably excludes it from the private libraries of most botanical students, it will be a satisfaction to them to know that the munificence of Mrs. Boott designed as a memorial of her husband, and extending, as we are informed, to a large number of Scientific institutions, has put it in their power to use a most important aid to their studies, from which they cannot fail to derive both pleasure and profit. The botanist of our district need no longer look with despair at his collection of species of this numerous and difficult genus, which contributes so largely to our local Flora. We may state, for the benefit of the uninitiated, that the Genus Carex consists of numerous species of plants, popularly called Sedges, and often confoundeded with coarse grasses, belonging to the order Cyperacæ, which stands next to the true grasses amongst Monocotyledonous plants. About 140 species are natives of the Northern and middle United States and Canada; upwards of 60 are found in Britain, and many in India, South America and other parts. The distinctions of the species require minute and careful observation, and most botanists find them among the most difficult plants to determine satisfactorily. Hence the peculiar interest of a treatise upon them by one who had long and carefully studied those from all parts of the world; whose learning, experience, habits of minute observation, and most favourable opportunities, in respect to books and specimens, qualified him to assist others, and who has spared neither labour nor expense in giving to his work the greatest possible value. At least one Canadian botanist, Mr. Macoun, of Belleville, Ontario, has made this genus a special study, and has been rewarded by remarkable success in detecting new and rare species. We may hope that the power of consulting Dr. Boott's splendid work, will induce more of our young botanists to turn their attention in this direction.

W. H.

ENTOMOLOGICAL SOCIETY OF CANADA.

REPORT FOR 1867.

The Council of the Entomological Society of Canada have much pleasure in presenting their *Fifth* Annual Report.

During the year 1867 considerable changes have been made in the list of members, chiefly occasioned, however, by removals. The total number has largely increased, being now 106; this increase is chiefly in the London Branch, which now numbers 63.

Five *regular* meetings, and one *field* meeting, have been held during the past year by the parent Society. The chief business transacted has been the preparation and adoption of a Constitution, which will shortly be published for the information of members, and the publication of a very valuable List of Canadian Coleoptera, prepared by Mr. Sanders of the London Branch. The Quebec Branch, with its usual activity, has held regular meetings, and continues in a flourishing condition.

The Council, in concluding this brief Report, beg to express the hope that the members of the Society will unite in infusing more life and vigour in its proceedings during the ensuing year, and that efforts may be made to increase the number of members, and render the meetings more attractive.

All which is respectfully submitted,

CHARLES J. S. BETHUNE,
Secretary.

Toronto, Jan. 16, 1868.

CONSTITUTION AND BYE-LAWS OF THE ENTOMOLOGICAL SOCIETY OF CANADA.

SECTION I.—(OBJECTS AND MEMBERSHIP.)

1. The Society shall be called "The Entomological Society of Canada," and is instituted for the improvement and advancement of Entomological Science, and the investigation of the character and habits of Insects.

2. The Society shall consist of four classes, viz., Members Ordinary, Life, Corresponding, and Honorary.

3. Ordinary Members shall be persons whose pursuits, or studies, are connected with Entomology, or who are collectors of Insects.

4. Life Members shall be persons who have made donations to the value of $50 in money, books, or specimens (the two latter to be valued by competent persons), or who may be elected as such at the general meeting of the Society, for important services performed, and after due notice has been given.

5. Corresponding Members shall be persons residing out of the Dominion of Canada, whose pursuits are similar to those of ordinary Members.

6. Honorary Members shall be persons of high standing, and eminence for their attainments in Entomology.

7. The number of Honorary Members shall be limited to twenty-five.

8. The officers of the Society shall consist of a President, two Vice-Presidents, and the *ex-officio* Vice-Presidents, as hereinafter provided, a Secretary, Treasurer, a Curator, and three other members to form a Council; all of whom shall be elected annually at the Annual General Meeting of the Society, and shall be eligible for re-election.

SECTION II.—(ELECTION OF MEMBERS.)

1. All candidates for admission into the Society, as Members, Corresponding Members, or life Members, must be proposed by a Member at a regular meeting of the Society, and be balloted for at the next regular meeting; the affirmative vote of three-fourths of the Members present shall be necessary for the election of a candidate.

2. Honorary Members must be recommended at least by three members, who shall certify that the person named is eminent for his Entomological attainments; the election in their case shall be conducted in the same manner as laid down for other members.

3. Whenever any person is elected a member in any class, the Secre-

tary shall immediately inform him of the same by letter; and no person shall be considered a member until he has signified his acquiesence in the election.

4. Every person elected a member is required to pay his first contribution within one month of the date of his election; otherwise his election shall be null and void.

SECTION III.—(CONTRIBUTIONS.)

I. The annual contribution of every ordinary Member shall be Two Dollars; all contributions to be due in advance, on the first day of January in each year. All new members, except those elected in the month of December, shall be required to pay the subscription for the year in which they are elected.

2. Every member shall be considered to belong to the Society, and as such be liable to the payment of his annual contribution, until he has either forfeited his claim, or has signified to the Secretary in writing his desire to withdraw, when his name shall be erased from the list of members.

3. Whenever any member shall be one year in arrear in the payment of his annual contribution, the Secretary shall inform him of the fact in writing; any member continuing two years in arrears shall be considered to have withdrawn from the Society, and his name shall be erased from the list of members.

4. Corresponding, Life, and Honorary Members shall not be required to pay any annual contribution.

SECTION IV.—(OFFICERS.)

1. The duties of the President shall be to preside at all meetings of the Society, to preserve good order and decorum, and to regulate debates.

2. The duties of the Vice-Presidents shall be the same as those of the Presidents, during his absence.

3. The duties of the Secretary-Treasurer shall be to take and preserve correct minutes of the proceedings of the Society, and to present and read all communications addressed to the Society, to notify members of their election, and those in arrear the amount of their indebtedness; to keep a correct list of the members of the Society, with the dates of their election, resignation or death, and their addresses, to maintain the correspondence of the Society, and to acknowledge all donations to it. He shall also take charge of the funds of the Society, and keep an accurate

account of all receipts and disbursements, and of the indebtedness of members, and render an annual report of the same at the Annual General Meeting of the Society.

4. It shall be the duty of the Curator to take charge of all books, specimens, cabinets and other properties of the Society; to receive and arrange in their proper places all donations of specimens; to keep a record of all contributions of books or specimens, with a list of the contributors; and to oversee and direct any exchange of specimens. He shall, also, report annually to the Society on the condition of the specimens and cabinets under his care,

5. The officers of the Society, together with three other members elected annually, shall form a Council who shall have the direction and management of all the affairs of the Society. The Council shall meet once in every quarter, the time and place of meeting to be appointed by the President, and notice to be given by the Secretary at least ten days beforehand.

6. The Council shall draw up a Yearly Report on the state of the Society, in which shall be given an abstract of all the proceedings, and of the receipts and expenditure of the Society during their term of office; and such Report shall be read at the Annual General Meeting.

SECTION V.—(MEETINGS.)

1. Ordinary Meeting shall be held once a month, the day and hour of meeting to be settled by Bye-laws, as may be deemed most expedient.

2. The Annual General Meeting of the Society shall be held on the First Tuesday in July in each year, to receive and deliberate upon the report of the Council on the state of the Society, and to elect officers and members of the Council for the ensuing year, and to transact any other business of which notice has been given.

3. Special meetings of the Society may be called by the President upon the written request of five members of the Society, provided that one week's notice of the meeting be given, and that its object be specified.

SECTION VI.—(BRANCHES OF THE SOCIETY.)

1. Branches of the Society may be formed in any place within the Dominion of Canada, on a written application to the Society, from at least six persons resident in the locality.

2. Each Branch shall be required to pay to the Parent Society one dollar per annum for each paying member on its list.

3. Every Branch shall be governed by the Constitution of the Society, but shall have power to elect its own officers, and enact Bye-laws for itself, provided they be not contrary to the tenor and spirit of the Constitution of the whole Society.

4. All the members of the Branches shall be members of the Society, and entitled to all the privileges of ordinary members,

5. No Corresponding or Honorary Members shall be appointed by the Branches, but such members may be proposed at General Meetings of the Society by any Branch, as well as by individual members.

6. The Presidents of the Branches shall be *ex-officio* Vice-Presidents of the Society.

7. Each Branch shall transmit to the parent Society an annual report of its proceedings, such report to be read at the Annual General Meeting.

SECTION VII.—(ALTERATION OF CONSTITUTION.)

1. No article in any Section of this Constitution shall be altered or added to, unless notice be first given at an ordinary meeting of the Society, or of a Branch, and the alteration or addition be sanctioned by two-thirds of members present at the next ensuing meeting; the Secretary of the Society, or of the Branch, shall then notify the Secretaries of all the other Branches; when the sanction of all the Branches has been obtained in the same manner, the alteration or addition shall become law.

ENTOMOLOGICAL SOCIETY OF CANADA.

BY-LAWS OF THE TORONTO BRANCH.

I. Ordinary meetings of the Society shall be held every month, the time and place to be appointed by the Council, and due notice to be given by the Secretary.

II. The following shall be the order of business at all ordinary meetings:—

1. The minutes of the previous meeting to be read and confirmed.
2. New members present to be introduced to the meeting.
3. Names of candidates for admission to be announced.
4. Business arising out of the minutes to be entered on.
5. Communications received since the last meeting to be announced, and read if required.

6. Donations received to be acknowledged.
7. Communications from the Council to be brought forward.
8. Election of candidates.
9. Papers to be read.
10. Specimens to be exhibited.

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MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JANUARY, 1867.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17.33 *min. West. Elevation above Lake Ontario,* 108 *feet.*

Day	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P.M.		6 A. M.	2 P. M.	10 P.M.	Result'.	ME'N		
1	29.807	29.842	29.911	29.8582	20.1	26.2	16.5	20.77	— 4.45	.098	.124	.076	.098	91	87	83	86	W b N	W	Calm.	N 89 W	4.0	10.6	0.0	5.19	5.28	...	...
2	.884	.777	.737	.7947	16.1	19.4	18.3	17.10	— 8.10	.081	.068	.087	.076	90	65	87	81	Calm.	SW bW	W S W	S 65 W	0.0	7.0	9.0	5.02	5.07	...	...
3	.733	.708	.676	.7037	10.7	25.9	21.9	18.83	— 6.32	.059	.085	.084	.077	82	60	71	73	Calm.	SW b W	Calm.	S 51 W	0.0	6.2	0.0	3.20	3.23	...	...
4	.657	.666	.664	.6597	27.0	35.2	29.8	30.03	+ 4.90	.129	.164	.154	.147	88	80	93	88	SW b W	Calm.	Calm.	S 5 W	4.0	0.0	0.0	0.54	2.07	...	0.5
5	.412	.162	.162	.2372	32.7	32.2	28.4	31.10	+ 5.97	.165	.155	.119	.143	88	85	76	81	E b N	N E b E	N N W	N 58 E	9.4	9.5	7.6	3.79	6.51	...	0.2
6	.289	.324	—	—	29.5	30.9	—	—	—	.136	.113	—	—	83	64	—	—	W b N	W N W	W b N	N 80 W	8.6	14.0	9.6	8.29	8.48	..	0.1
7	.543	.551	.541	.5520	17.6	21.2	17.6	18.18	— 6.95	.088	.072	.070	.074	92	63	72	76	W N W	W b N	W b N	N 72 W	8.0	12.6	2.8	7.23	7.30	...	0.1
8	.429	378	.436	.4162	17.9	21.2	13.2	17.90	— 7.23	.072	.072	.060	.072	74	63	75	73	W N W	N W b N	N W	N 40 W	1.0	12.0	4.4	4.37	4.44	...	0.1
9	.367	.221	.132	.2323	18.3	26.2	21.2	21.90	— 3.23	.087	.124	.099	.104	87	87	87	88	Calm.	Calm.	N b W	N 15 W	0.0	0.0	3.5	0.33	0.46	...	1.5
10	.079	.083	.198	.1327	17.2	22.6	19.7	19.72	— 5.33	.087	.076	.083	.081	92	62	78	77	N E b N	Calm.	Calm.	N 49 W	1.6	0.0	0.0	1.41	2.01	...	0.5
11	.303	.410	.599	.4567	15.8	23.3	10.4	16.43	— 8.62	.072	.074	.055	.067	80	59	78	73	Calm.	W S W	Calm.	N 67 W	0.0	9.6	0.0	4.97	5.64	...	0.1
12	.843	.968	.881	.8990	10.4	14.3	6.8	9.60	—15.48	.062	.041	.045	.049	89	48	75	74	W N W	N W b N	N E b N	N 7 W	10.2	4.8	6.0	6.15	7.60	...	0.5
13	.639	.426	—	—	8.6	11.1	—	—	—	.057	.065	—	—	91	92	—	—	N E b E	N E b E	N b E	N 46 E	13.5	13.4	3.0	9.40	9.97	...	4.0
14	.616	.627	.579	.6185	8.6	12.5	7.5	9.33	—15.77	.058	.055	.043	.052	91	73	69	77	N N E	N b E	N b E	N 22 E	2.6	0.5	9.6	4.16	4.22	...	...
15	.682	.755	.816	.7583	1.7	8.9	—2.7	3.12	—21.98	.038	.033	.033	.036	80	48	87	72	N	N W b N	Calm.	N 11 W	8.6	1.6	0.0	3.79	3.87	...	...
16	.713	.500	.352	.5023	7.8	23.7	21.5	17.75	— 7.25	.056	.117	.109	.093	91	93	94	92	Calm.	S W	N E	N 77 E	0.0	4.6	9.0	1.98	5.39	...	6.0
17	.350	.555	.811	.6023	14.7	13.6	9.6	12.22	—12.80	.078	.072	.053	.066	93	91	77	86	N	N b W	N N W	N 20 W	3.2	14.0	22.0	13.71	14.01	...	2.0
18	.927	.834	.784	.8417	—0.1	7.5	3.5	3.00	—21.97	.037	.049	.040	.041	85	78	75	80	N W b N	N W	N N W	N 39 W	8.0	22.0	18.5	15.68	16.00	...	...
19	.724	.545	.497	.5733	1.7	12.5	5.3	5.80	—19.08	.044	.055	.052	.048	91	73	92	84	Calm.	W b N	Calm.	S 89 W	0.0	14.5	0.0	4.13	4.22	...	...
20	.449	.355	—	—	11.1	17.9	—	—	—	.060	.091	—	—	83	94	—	—	Calm.	N E b N	N E b E	N 66E	0.0	9.5	17.7	9.16	9.57	...	15.0
21	.140	.130	.283	.1960	14.7	18.6	17.2	17.08	— 7.70	.078	.083	.087	.084	93	83	91	90	E N E	N b E	Calm.	N 33 E	11.8	10.0	0.0	5.25	5.60	...	3.0
22	.391	.480	.609	.5028	14.0	21.9	19.7	18.42	— 6.35	.074	.090	.096	.087	90	77	91	87	Calm.	Calm.	N W b W	N 61 W	0.0	0.0	7.8	3.58	3.62	...	...
23	.650	.687	.844	.7452	19.7	27.0	25.9	23.97	— 0.70	.096	.100	.110	.101	91	68	79	79	N W b W	N W	N W b W	N 52 W	9.6	18.6	10.6	8.92	9.23	...	inap.
24	.937	.935	.949	.9422	25.2	28.0	25.5	26.33	+ 1.77	.122	.124	.118	.122	90	81	86	86	N W b N	Calm.	N N W	N 25 W	6.0	0.0	0.6	1.26	1.67	...	...
25	.847	.400	.053	.4008	21.5	27.3	29.1	26.03	+ 1.45	.102	.126	.155	.129	88	84	96	90	N E b E	E b S	E b S	S 80 E	2.7	16.0	12.5	9.22	11.54	...	6.0
26	28.945	28.920	.076	28.9913	29.5	27.3	22.6	25.98	+ 1.50	.136	.118	.104	.119	83	79	86	84	S W b S	W S W	W	S 75 W	13.0	19.0	16.0	14.10	14.82	...	1.0
27	29.224	29.325	—	—	17.6	20.5	—	—	—	.088	.068	—	—	92	61	—	—	N W	W N W	N W b W	N 64 W	7.6	22.0	11.5	11.50	11.69	...	0.2
28	.632	.599	.549	29.6003	14.7	20.8	14.3	16.42	— 7.88	.078	.083	.071	.075	93	75	85	81	W b N	W S W	W S W	S 68 W	4.5	15.2	16.0	12.63	12.89	...	...
29	.562	.641	.848	.7037	6.4	10.4	7.5	8.27	—15.93	.044	.055	.054	.052	75	78	88	82	W S W	W b S	W b N	N 88 W	14.0	3.3	10.5	7.43	7.88	...	1.0
30	.984	.969	.831	.9202	4.2	14.0	12.9	10.53	—13.57	.047	.074	.063	.062	89	91	80	86	N b E	Calm.	W b S	S 46 W	1.6	0.0	4.6	3.04	4.35	...	0.2
31	.687	.579	.267	.4840	20.1	30.2	36.3	29.12	+ 5.13	.098	.149	.210	.155	91	89	98	93	S S W	S S W	S S W	S 43 W	1.5	1.0	8.0	6.16	6.99	inap.	...
M	29.5868	29.5527	29.5587	29.5676	15.12	21.18	17.02	17.59	— 7.21	.081	.090	.086	.086	88	75	83	82	....	....	....	....	5.00	8.76	7.12	......	6.96	inap.	42.0

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY, 1867.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely, at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . . . 30.046 at 10 a.m. on 30th. } Monthly range=
Lowest Barometer . . . . . . 29.920 at 2 p.m. on 26th. } 1.126 inches.

Self-registering Ther.:
- Maximum temperature . . . 43°.8 on 31st. } Monthly range=
- Minimum temperature . . . —4°.8 on 16th. } 48°6
- Mean maximum temperature . . 23°23 } Mean daily range=11°62
- Mean minimum temperature . . 11°61 }
- Greatest daily range . . . . . . 31°6 from a.m. to p.m. of 31st.
- Least daily range . . . . 4°2 from a.m. to p.m. of 17th.

Warmest day . . . . 5th...Mean Temperature . . . 31°10 } Difference=28°.10
Coldest day . . . . . 18th...Mean Temperature . . . 3°00 }

Maximum } Solar . . . . 92°0 on 23rd. } Monthly range=
Radiation } Terrestrial . . . . —13°8 on 16th. } 105°.8

No Aurora observed.
Possible to see Aurora on 10 nights; impossible on 21 nights.
Snowing on 21 days; depth 42.0 inches; duration of fall 165.1 hours.
Raining on 1 day; depth inapp.; duration of fall, 1.0 hours.
Mean of cloudiness=0.73; Most cloudy hour observed, 6 a.m; mean=0.82; least cloudy hour observed, 2 p.m.; mean=0.64.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2055.91	662.79	953.05	2937.46

Resultant direction, N. 55° W.; Resultant Velocity, 3.27 miles per hour.
Mean velocity 6.98 miles per hour.
Maximum velocity 25.8 miles, from 1 to 2 a.m. of 19th.
Most windy day 18th—Mean velocity 16.00 miles per hour. } Difference 15.54.
Least windy day 9th—Mean velocity 0.46 miles per hour. }
Most windy hour, noon. —Mean velocity, 8.97 miles per hour. } Difference
Least windy hour, 7 a.m.—Mean velocity, 5.09 miles per hour. } 3.88 miles.

12th, Lunar halo 7 p.m.—14th, Lunar halo.
29th, Stormy day, heavy snow storm continuing to about 7 p.m. of following day.
25th, Stormy day, snow and drift.
29th, Solar halo and parhelia.

COMPARATIVE TABLE FOR JANUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average	Maximum	Minimum	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	17.0°	— 6.3	36.7°	—18.6°	55.3°	4	1.395	11	...	...	...	...
1841	25.6	+ 2.3	42.3	— 6.4	48.7	2	2.150	14	...	...	...	0.36 lbs
1842	27.9	+ 4.6	49.4	1.9	47.5	5	2.170	9	...	...	...	0.78 "
1843	28.7	+ 5.4	55.4	— 1.8	57.2	6	4.295	12	14.2	...	...	0.69 "
1844	29.2	— 3.1	45.3	— 7.2	52.5	7	3.005	11	24.9	...	...	0.70 "
1845	26.5	+ 3.2	45.7	— 0.2	45.9	5	Imp.	9	22.7	...	...	0.70 "
1846	26.7	+ 3.4	44.0	— 1.3	45.3	5	2.335	10	6.0	...	...	0.55 "
1847	23.3	0.0	42.4	2.7	39.7	7	2.135	5	7.5	...	...	1.09 "
1848	28.7	+ 5.4	51.1	—11.4	62.5	7	2.245	8	7.1	N 82 W	2.03	5.82 ms
1849	18.5	— 4.8	39.5	—14.2	53.7	4	1.175	10	9.2	N 63 W	3.06	6.71 "
1850	29.7	+ 6.4	46.4	9.9	36.5	5	1.250	8	5.2	N 37 W	0.69	5.80 "
1851	25.5	+ 2.2	43.4	—12.8	56.2	4	1.275	10	7.8	S 77 W	3.26	7.69 "
1852	18.4	— 4.9	37.3	—10.6	47.9	0	0.000	19	30.9	N 68 W	3.14	7.67 "
1853	23.0	— 0.3	40.9	— 9.7	50.6	1	0.290	6	7.5	N 27 W	2.52	6.34 "
1854	23.6	+ 0.3	46.4	— 5.4	51.8	7	1.270	11	7.5	N 77 W	2.44	6.91 "
1855	25.9	+ 2.6	49.0	— 5.4	54.4	5	0.525	13	23.3	N 73 W	1.91	7.26 "
1856	16.0	— 7.3	34.4	—12.0	46.4	0	0.000	14	13.6	N 75 W	5.24	10.69 "
1857	12.8	—10.5	37.2	—20.1	57.3	3	Inap.	16	21.8	N 70 W	4.96	10.31 "
1858	30.0	+ 6.7	47.4	6.5	40.9	6	1.152	11	4.0	N 71 W	2.33	7.40 "
1859	26.4	+ 3.1	43.2	—26.5	69.7	6	1.449	19	16.4	S 81 W	3.17	8.76 "
1860	23.4	+ 0.1	46.4	— 6.8	53.2	6	0.740	16	8.7	N 89 W	6.09	9.37 "
1861	19.9	— 3.4	37.0	—11.2	48.2	4	0.685	23	20.6	N 86 W	2.92	9.30 "
1862	21.7	— 1.6	44.5	— 2.6	47.1	5	0.115	19	27.4	N 26 W	2.69	8.83 "
1863	28.1	+ 4.8	47.0	—14.0	61.0	10	1.122	17	20.6	N 61 W	1.13	7.23 "
1864	22.8	— 0.5	44.2	— 9.0	53.2	5	1.165	14	26.3	S 73 W	6.00	10.22 "
1865	17.7	— 5.6	37.2	— 9.0	46.2	1	0.440	18	14.8	N 85 W	4.80	9.39 "
1866	20.7	— 2.6	44.0	—14.0	58.0	4	0.522	19	10.3	N 75 W	2.98	9.34 "
1867	17.6	— 5.7	43.8	— 4.8	48.6	1	Inap.	21	42.0	N 55 W	3.27	6.96 "
Results to 1866.	23.29	...	43.62	—7.75	51.37	4.59	1.266	13.0	14.93	N 78 W	3.02	8.16
Ex. for 1867.	—5.69	...	+0.18	+2.95	—2.77	— 3.59	— 1.266	+ 8.00	+ 27.07	...	...	—1.20

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST, FEBRUARY,—1867.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *m.* 33 *s. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10PM	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 P.M	10 P.M.	Re-sul't.	ME'N		
1	29 247	29.444	29.597	29.4453	40.3	34.2	28.7	33.57	+ 9.68	.176	.110	.145	.142	69	55	92	73	W	W b N	Calm.	N 78 W	19.2	18.6	0.0	9.19	10.04	...	...
2	.500	.194	28.926	.1755	26.2	26.6	31.6	28.50	+ 4.65	.124	.134	.156	.138	87	93	87	88	N E	E b N	E	N 82 E	9.0	21.0	17.0	14.29	15.63	.076	2.0
3	28.799	28.893	—	—	33.4	31.6	—	—	—	.188	.170	—	—	98	96	—	—	S W b S	W S W	W b N	S 66 W	11.8	11.6	12.1	9.52	10.90	...	2.5
4	29.325	29.332	29.182	.2747	29.1	31.5	31.3	30.23	+ 6.55	.141	.134	.174	.148	87	75	99	87	S W	E b N	E b N	N 72 E	2.2	5.2	15.8	7.77	9.07	...	3.0
5	.201	.378	.606	.4172	27.3	29.1	28.4	28.38	+ 4.80	.139	.126	.126	.129	94	78	81	83	N b E	W b N	W S W	N 69 W	6.5	5.8	3.3	4.02	5.58	...	0.1
6	.650	.739	.875	.7735	27.3	31.6	27.0	28.27	+ 4.75	.133	.156	.129	.135	89	87	88	87	S W	Calm.	S W b S	S 50 W	4.2	0.0	8.0	6.86	7.05	...	...
7	.906	.894	.832	.8775	25.9	36.0	25.9	29.20	+ 5.77	.120	.137	.120	.126	86	65	86	79	S W b S	S	Calm.	S 18 W	12.0	6.5	0.0	3.74	4.00	...	...
8	.766	.599	.396	.5692	21.5	39.2	37.4	32.37	+ 9.00	.102	.122	.170	.132	88	50	75	73	N E b E	E b S	N E	N 71 E	4.0	4.6	0.6	1.52	1.61	inap.	...
9	.232	.180	.305	.2452	33.1	27.7	17.9	25.87	+ 2.60	.174	.142	.085	.131	92	94	87	91	Calm.	N N W	W N W	N 49 W	0.0	20.2	25.5	17.12	18.42	...	2.5
10	.590	30.012	—	—	6.4	9 3	—	—	—	.044	.039	—	—	75	58	—	—	W b N	W N W	W S W	N 74 W	18.5	18.6	2.8	9.26	10.42	...	...
11	30.332	30.069	30.009	30.1268	11.4	27.0	31.6	24.30	+ 1.03	.062	.080	.096	.087	85	54	54	67	W S W	S W b S	S W b S	S 35 W	9.5	22.0	16.5	12.92	12.98	...	...
12	30.019	29.976	29.948	29.9863	33.4	38.8	34.5	35.35	+12.10	.171	.177	.181	.075	89	75	90	85	S W b S	S S W	Calm.	S 32 W	5 0	5.5	0.0	4.19	4.21	.082	...
13	29.820	.603	.528	.6428	38.5	38.5	39.2	39.28	+16.03	.208	.233	.241	.229	89	100	100	95	S W b S	S b W	S W b S	S 51 W	6.8	7.0	6.4	4.96	7.36	.630	...
14	.834	.892	.996	.9148	35.3	33.1	30.6	32.08	+ 8.82	.181	.145	.131	.148	88	76	76	80	N W b N	N b W	N	N 2 E	12.4	11.6	11.0	8.64	9.87	...	inap.
15	30.084	30.040	.834	.9742	20.1	25.9	29.5	25.03	+ 1.78	.091	.090	.144	.107	85	64	87	78	N E	E	E b N	N 82 E	6.0	10.5	17.6	12.61	12.85	.155	...
16	29.445	29.207	.332	.3150	35.6	41.7	37.8	38.37	+15.00	.202	.158	.122	.162	97	58	53	70	E	S W b S	W S W	S 60 W	13.2	13.0	22.0	13.18	16.73	.250	...
17	.500	.659	—	—	35.6	36.3	—	—	—	.116	.107	—	—	55	49	—	—	W	W b S	Calm.	S 83 W	20.0	18.0	0.0	8.58	9.50	...	...
18	.688	.487	.584	.5862	32.0	33 1	28.0	31.70	+ 8.27	.158	.160	.131	.155	87	85	86	87	S E b E	E b N	W b N	N 30 E	4.2	7.8	2.8	3.35	6.15	...	0.2
19	.782	.858	.779	.8108	26.6	24.1	21.5	23.32	— 0.22	.112	.078	.063	.084	77	60	54	66	N N E	E N E	E	N 58 E	7.2	3.6	11.6	8.92	10.21	...	0.5
20	.662	.657	.727	.6815	12.2	25.2	25.5	21.62	— 2.00	.065	.115	.125	.107	86	85	91	90	N E b E	N E b E	E N E	N 68 E	17.0	11.0	11.0	10.30	10.66	...	1.0
21	.587	.408	.597	.5293	29.1	25.2	26.6	26.67	+ 2.93	.141	.115	.119	.124	87	85	82	85	E b S	N E	N W	N 17 E	7.6	15.5	10.4	7.20	10.90	...	1.5
22	.717	.848	.849	.8125	25.5	23.0	15.0	21.25	— 2.57	.118	.071	.069	.086	86	57	79	74	W N W	N W	N N E	N 56 W	15.0	16.0	2.0	5.40	10.10	...	inap.
23	.593	.249	.006	.2563	26.6	35.6	36.7	32.60	+ 8.67	.119	.149	.188	.160	82	72	86	85	E S E	E b S	Calm.	S 75 E	10.0	6.5	0.0	1.94	8.10	.110	0.1
24	.260	.528	—	—	30.6	27.7	—	—	—	.152	.128	—	—	89	84	—	—	W b N	W b N	N N W	N 63 W	24.5	17.0	9.9	11.25	12.06	...	...
25	.821	.789	.742	.7840	12.5	22.6	23.7	19.72	— 4.62	.062	.096	.095	.084	80	79	73	77	N b E	E N E	Calm.	N 56 E	6.8	7.0	0.0	3.46	3.73	...	inap.
26	.777	.865	.995	.8925	20.1	35.3	24.8	27.18	+ 2.65	.091	.104	.105	.104	85	51	79	72	Calm.	W b N	Calm.	N 88 W	0.0	16.0	0.0	4.89	4.98	...	...
27	30.012	30.051	30.017	30.0248	17.9	30.2	30.6	26.72	+ 2.00	.085	.128	.138	.120	87	76	80	81	Calm.	E b S	E S E	S 86 E	0.0	8.6	4.6	2.67	3.39	...	...
28	29.794	29.657	29.627	29.6800	27.3	35.1	34.9	32.33	+ 7.43	.118	.165	.176	.152	79	81	86	82	N N E	Calm.	Calm.	N 79 E	2.4	0.0	0.0	1.22	1.32	.025	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.6998	29.6423	29.6370	29.6582	26.45	31.26	29.11	28.91	+ 5.24	.129	.130	.135	.132	86	73	81	81	....	....	....	....	9.11	11.02	7.53	...	8.85	1.328	13.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR FEBRUARY, 1867.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer ....30.332 at 6 a.m. on 11th } Monthly range =
Lowest Barometer ....28.799 at 6 a.m. on 3rd } 1.533 inches.

Self-registing Thermom.
Maximum Temperature ....44°0 on 13th and 16th } Monthly range =
Minimum Temperature .... 0°2 on 10th } 43°8
Mean maximum Temperature...............................34°32 } Mean daily range =
Mean minimum Temperature...............................21°59 } 12°73
Greatest daily range......27°6 from a.m. to p.m. of 11th.
Least daily range .... 2°4 from a.m. to p.m. of 14th.

Warmest day.........13th...Mean temperature...............39°28 } Difference = 19°56
Coldest day.......... ..25th ...Mean temperature............ ..19°72 }

Maximum Radiation. { Solar .... 113°5 on 22nd } Monthly range =
Maximum Radiation. { Terrestrial .... —7°6 on 11th } 121°1

No Aurora observed
Possible to see Aurora on 7 nights; Impossible on 21 nights.
Snowing on 13 days; depth 13.4 inches; duration of fall 80.2 hours.
Raining on 8 days; depth 1.328 inches; duration of fall 30.6 hours.
Mean of cloudiness = 0.82.
Most cloudy hour observed, 4 p.m.; mean = 0.86; least cloudy hour observed, 2 p.m.; mean = 0.78.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1693.36	1123.88	1886.45	2778.62

Resultant direction N. 57° W.; Resultant velocity 1.58 miles per hour.
Mean velocity.................................8.85 miles per hour.
Maximum velocity.........................29.0 miles, from 9 to 10 p.m. of 9th.
Most windy day......... 9th......... Mean velocity, 18.42 miles per hour. } Difference =
Least windy day.........28th......... Mean velocity, 1.32 ditto } 17.10 miles.
Most windy hour ...... 3 p.m.........Mean velocity, 11.72 ditto } Difference =
Least windy hour...... 1 a.m ....Mean velocity, 6.24 ditto } 4.48 miles.

1st. Warm gusty wind. 4th. Solar halo and parhelia.
8th. Lunar halo. 9th. Heavy snow and drift.
11th. Solar halo, lunar halo during evening.
28th. Indistinct lunar halo.

COMPARATIVE TABLE FOR FEBRUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above aver'ge	Max.	Min.	Range.	No. of days.	Inches	No. of days.	Inches	Resultant. Direction.	Resultant. V'y.	Mean Force or Velocity.
1840	° 28.0	° + 5.0	° 50.3	° —10.5	° 60.8	8	1.475	6	..	...	...	....
1841	22.4	— 0.6	44.1	— 1.3	45.4	1	inap.	9	...	...	...	0.61 lbs.
1842	26.9	+ 3.9	50.2	2.9	47.3	8	3.625	9	...	...	...	1.03
1843	14.5	— 8.5	38.5	— 9.4	47.9	1	0.475	21	14.4	...	...	1.05
1844	26.0	+ 3.0	47.9	0.6	47.3	4	0.430	7	10.0	...	...	0.43
1845	26.0	+ 3.0	49.1	— 4.2	53.3	5	imp.	9	19.0	...	...	0.99
1846	20.4	— 2.6	41.9	—16.7	58.6	0	0.000	13	46.1	...	...	0.65
1847	21.5	— 1.5	40.9	0.0	40.9	2	0.550	13	27.3	...	...	0.69
1848	26.6	+ 3.6	46.6	0.0	46.6	4	0.775	8	10.8	N 65 W	2.53	5.69mls.
1849	19.5	— 3.5	40.6	— 9.8	50.4	2	0.240	13	19.2	N 41 W	1.48	6.58
1850	26.0	+ 3.0	49.6	2.2	47.4	7	1.235	9	23.1	N 80 W	3.43	7.61
1851	27.6	+ 4.6	50.2	2.0	48.2	7	2.600	4	2.4	N 64 W	1.99	6.94
1852	23.4	+ 0.4	41.2	— 6.2	47.4	3	0.650	11	13.0	S 75 W	3 34	6.42
1853	24.1	+ 1.1	43.4	— 1.4	44.8	4	1.030	15	12.6	N 49 E	2.51	7.30
1854	21.1	— 1.9	42.8	—10.8	53.6	5	1.460	15	18.0	N 7 E	1.73	6.91
1855	15.4	— 7.6	39.0	—25.4	64.4	2	1.770	14	21.8	N 40 W	4.34	8.17
1856	15.7	— 7.3	37.8	—18.7	56.5	0	0.000	8	9.7	N 81 W	7.70	10.71
1857	28.5	+ 5.5	52.4	— 5.9	58.3	11	3.050	11	11.7	S 78 W	3.63	9 82
1858	17.0	— 6.0	42.4	— 7.3	49.7	1	inap.	16	26.7	N 72 W	3.22	9.12
1859	26.0	+ 3.0	46.2	2.1	44.1	6	0.455	14	8.3	N 54 W	2.72	8.50
1860	22.8	— 0.2	50.2	— 8.5	58.7	7	1.330	13	18.8	N 61 W	3.28	8.73
1861	26.1	+ 3.1	46.0	—20.8	66.8	4	0.815	17	29.7	N 77 W	3.86	10.58
1862	22.5	— 0.5	37.8	— 5.2	43.0	3	0.180	17	23.1	N 55 W	3.93	8.52
1863	22.4	— 0.6	41.5	—19.8	61.3	7	1.450	12	22.0	N 23 W	2.29	10.13
1864	24.3	+ 1.3	45.0	—15.0	60.0	2	0.397	4	9.5	S 84 W	6.48	10.11
1865	22.4	— 0.6	42.2	—10.0	52.2	5	0.810	11	16.8	N 23 W	3.95	8.23
1866	22.5	— 0.5	45.0	— 8.0	53.0	3	0.830	12	16.9	S 80 W	5.14	9.40
1867	28.9	+ 5.9	44.0	0.2	43.8	8	1.328	13	13.4	N 57 W	1.58	8.85
Results to 1866.	22.95	...	44.55	—7.60	52.15	4.2	0.986	11.9	18.00	N 70° W	3.20	8.39
Excess for 1867.	+ 5.95	...	— 0.55	+ 7.80	— 8.35	+ 3.8	+ 0.342	+ 1.1	— 4.60	....	...	+ 0.46

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—MARCH, 1867.

Latitude—43 *deg.* 39.4 *min. North.* *Longitude*—5 *h.* 17 *min.* 33 *sec. West.* *Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M.	10 PM	ME'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M	2 P.M	10 PM	Resul't.	ME'N		
1	29.508	29.240	28.967	29.2110	32.4°	32.7°	34.2°	33.08°	+ 7.87°	.161	.150	.196	.169	87	80	99	89	E N E	E	Calm.	N 51° E	9.0	6.5	0.0	0.90	6.18	.050	...
2	.009	.358	29.653	.3770	38.5	22.3	15.8	24.68	— 0.73	.216	.101	.072	.122	93	85	80	83	W	N W b W	N W	N 52 W	21.0	29.0	12.5	16.23	17.43	...	...
3	.757	.701	—	—	9.6	19.0	—	—	—	.053	.085	—	—	77	83	—	—	N E	E	N E	N 64 E	6.0	9.0	16.5	10.73	11.92	...	1.0
4	.391	.561	.757	.5868	14.7	23.9	24.1	21.20	— 4.80	.072	.081	.100	.088	85	62	77	77	N b W	W b N	Calm.	N 36 W	11.6	2.3	0.0	2.80	3.15	...	0.5
5	.827	.918	30.022	.9348	25.9	29.1	22.3	26.00	— 0.20	.128	.083	.101	.105	91	50	85	76	S W	W	W	N 79 W	3.2	15.0	0.5	5.50	8.45	...	...
6	30.114	.998	29.853	.9673	16.5	30.2	25.9	23.83	— 2.67	.076	.128	.107	.103	83	76	76	79	N b E	E b S	E	N 75 E	11.0	11.6	17.5	12.36	13.35	...	2.0
7	29.599	.650	.975	.7580	25.5	28.4	16.8	23.15	— 3.67	.133	.119	.073	.106	96	76	78	83	E b N	N N W	N b W	N 18 E	16.2	11.2	1.0	4.54	6.33	...	1.0
8	30.088	30.084	30.002	30.0518	18.3	32.0	27.0	25.75	— 1.48	.093	.143	.129	.118	94	79	88	84	Calm.	SE b S	N E	N 64 E	0.0	5.0	4.2	3.36	4.78	...	...
9	29.878	29.851	29.840	29.8510	24.8	32.0	29.5	28.78	+ 1.27	.120	.106	.136	.123	90	58	82	78	NE b E	E S E	NE b E	N 69 E	5.2	4.8	3.2	4.68	4.97	...	...
10	.671	.388	—	—	32.0	37.1	—	—	—	.158	.182	—	—	87	83	—	—	E b N	E N E	S E	N 60 E	9.5	5.6	1.9	1.36	8.38	.135	...
11	.558	.754	.769	.7153	36.7	35.3	30.9	34.28	+ 6.05	.205	.127	.141	.158	94	61	81	79	W b N	N N W	N b E	N 22 W	10.5	5.0	1.8	4.92	5.70	...	0.2
12	.566	.500	.636	.5673	27.7	34.2	31.6	30.93	+ 2.38	.142	.147	.156	.146	94	75	87	84	N N E	N b E	N N W	N 18 E	3.6	5.4	7.6	4.33	4.69	...	1.0
13	.562	.432	.581	.5282	30.2	33.1	19.0	27.13	— 1.83	.149	.160	.085	.129	89	85	82	84	E	S W b S	W b S	S 78 W	1.8	11.0	23.0	12.94	14.30	inap.	0.2
14	.753	.812	.893	.8328	11.1	18.6	15.4	14.73	—14.58	.060	.052	.059	.058	83	51	66	69	W b S	W b S	SW bW	S 75 W	9.0	17.0	8.5	11.35	11.55	...	...
15	30.005	.991	.995	30.0030	10.0	23.0	19.4	17.83	—11.88	.054	.058	.087	.070	78	47	83	72	W b S	W S W	SW bW	S 63 W	1.5	9.8	5.8	5.81	5.86	...	...
16	29.961	.747	.501	29.7088	16.1	26.6	25.5	23.15	— 6.88	.074	.084	.125	.102	83	58	91	81	Calm.	E b N	E b S	S 82 E	0.0	16.5	16.8	12.77	13.05	...	5.5
17	.229	.298	—	—	24.8	28.0	—	—	—	.120	.139	—	—	90	90	—	—	SE b E	W	W b S	S 89 W	4.8	15.2	14.2	14.01	14.59	...	1.5
18	.662	.676	.727	.7002	11.1	21.9	16.8	15.45	—15.40	.055	.072	.066	.061	74	61	72	68	W b S	W b S	W	S 78 W	17.0	15.5	2.0	7.86	7.94	...	...
19	.828	.891	30.004	.9213	4.2	29.5	19.0	19.98	—11.28	.042	.106	.078	.084	78	65	76	74	Calm.	Calm.	W S W	N 4 W	0.0	0.0	1.5	0.96	1.12	...	...
20	30.073	30.087	30.042	30.0652	20.8	33.1	27.3	28.02	— 3.65	.104	.057	.126	.104	92	30	84	71	N N E	E S E	N E	N 75 E	2.2	10.0	1.0	5.68	5.97	...	...
21	29.901	29.777	29.678	29.7767	30.9	34.5	33.1	32.53	+ 0.45	.149	.144	.174	.158	86	72	92	85	E b N	E b N	E	N 85 E	12.5	19.8	15.0	14.59	14.67	...	15.0
22	.718	.752	.830	.7725	30.9	34.9	32.7	32 77	+ 0.28	.171	.144	.157	.158	99	71	84	85	E	E	Calm.	S 89 E	10.0	5.2	0.0	3.25	3.42	...	1.5
23	.852	.854	.814	.8417	32.4	36.0	34.2	34.72	+ 1.93	.161	.162	.177	.171	87	76	89	85	E N E	E b N	NE b E	N 73 E	2.8	8.8	3.6	4.60	4.63	.007	...
24	.752	.626	—	—	33.1	35.6	—	—	—	.184	.193	—	—	98	93	—	—	Calm.	E b N	SE b S	S 41 E	0.0	4.0	3.7	0.86	3.15	.070	1.5
25	.646	.810	.974	.8285	34.2	30.2	26.6	29.97	— 3.60	.160	.112	.119	.126	81	67	82	76	W S W	W N W	N W	N 68 W	10.3	17.0	10.0	12.18	13.20	...	...
26	30.007	.902	.726	.8548	18.6	29.1	26.2	25.25	— 8.73	.082	.126	.124	.111	83	78	87	82	N	S	E N E	N 70 E	4.6	2.0	1.2	4.13	6.18	...	0.5
27	29.481	.393	.423	.4245	25.2	27.0	26.2	26.05	— 8.37	.122	.129	.128	.127	89	88	90	89	NE b E	NE b N	Calm.	N 18 E	16.2	7.0	0.0	6.35	8.19	...	2.0
28	.449	.461	.509	.4760	22.3	32.0	24.4	26.00	— 8.72	.094	.092	.083	.088	78	51	62	63	NW bN	W N W	W b N	N 49 W	17.0	21.4	15.0	14.07	14.68	...	...
29	.513	.406	.409	.4400	17.6	39.6	29.5	29.48	— 5.62	.083	.091	.137	.107	85	37	83	68	W b N	W N W	W N W	N 74 W	10.2	22.0	11.2	14.43	14.52	...	...
30	.386	.287	.310	.3262	29.1	43.5	36.0	37.05	+ 1.55	.118	.109	.172	.132	73	37	81	62	W b N	W S W	Calm.	S 81 W	12.4	15.0	0.0	8.17	8.56	...	...
31	.394	.396	—	—	32.4	42.8	—	—	—	.153	.168	—	—	83	61	—	—	W	S W b S	Calm.	S 60 W	1.0	3.4	0.0	0.93	3.15	.355	...
M	29.7052	29.6997	29.7265	29.7123	23.30	30.49	25.79	26.61	— 3.77	.116	.111	.120	.116	86	64	82	78	....	....	....	....	7.75	10.68	6.43	... ...	8.52	.617	33.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH, 1867.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M., 2 P.M., 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer . . . . 30.127 at 10 a.m. on 6th. } Monthly range=
Lowest Baromoter . . . . 28.912 at Mid. on 1st. } 1.215 inches.

Self-registering Ther.
Maximum Temperature . . . . . 46°.8 on 31st. } Monthly range=
Minimum Temperature . . . . . 3°.0 on 19th. } 43°.8
Mean Maximum Temperature . . 33°89 } Mean daily range=12°78
Mean Minimum Temperature . . 21°11 }
Greatest daily range . . . . 27°6 from a.m. to p.m. of 19th.
Least daily range . . . . 2°6 from a.m. to p.m. of 11th.

Warmest day . . . . 30th ...Mean Temperature . . . 37°05 } Difference=22°.32
Coldest day . . . . . 14th ...Mean Temperature . . . 14°73 }

Maximum Radiation. { Solar . . . . 117°.0 on 28 & 30 } Monthly range=
{ Terrestrial . . . . —5°.4 on 19th } 122.4

Aurora observed on 1 night, viz.—7th.
Possible to see Aurora on 11 nights; impossible on 20 nights.
Snowing on 14 days; depth 33.4 inches; duration of fall 107.3 hours.
Raining on 6 days; depth 0.617 inches; duration of fall 31.0 hours.
Mean of cloudiness=0 72; most cloudy hour observed, 4 p.m.; mean=0.75; least cloudy hour observed, 12 p.m.; mean=0.68.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1836.57	529.80	2238.77	3117.56

Resultant Direction, N. 34° W.; Resultant Velocity, 2.12.
Mean Velocity, 8.52 miles per hour.
Maximum Velocity, 32.3 miles, from 1 to 2 p.m. of 2nd.
Most windy day, 2nd —Mean velocity 17.43 miles per hour. } Difference,
Least windy day, 19th—Mean velocity 1.12 miles per hour. } 16.31 miles
Most windy hour, 1 p.m.—Mean velocity 11.26 miles per hour. } Difference,
Least windy hour, 10 p.m.—Mean velocity 6.16 miles per hour. } 5.10 miles
1st. Fine Solar halo. Lightning during evening, first of year.
4th. Solar halo. 6th, perfect Solar halo.
15th. Lunar halo. 16th, Solar halo, very stormy night.
19th. Lunar halo. 20th, Lunar halo.
21st. Heavy snow storm from 1 p.m. to noon of 22nd.
26th. Solar halo. 27th, stormy morning, snow and drift.
28th. Solar parhelia. 30th, Solar halo.
31st. Blue Birds numerous.
27th. First Schooner arrived at Rees' wharf.

COMPARATIVE TABLE FOR MARCH.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Excess above Average.	Maximum	Minimum	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Force or Velocity
1840	33.3°	+ 3.4°	58.6°	9.2°	49.4°	8	1.640	8	...	...	...	...
1841	27.7	— 2.2	54.6	—6.7	61.3	5	1.170	7	...	...	...	0.51 lbs
1842	35.8	+ 5.9	70.3	15.1	55.2	4	3.150	8	...	...	...	0.71 "
1843	21.3	— 8.6	39.9	—2.5	42.4	2	0.625	18	25.7	...	...	1.18 "
1844	31.3	+ 1.4	50.8	9.6	41.2	8	2.470	8	14.0	...	...	0.57 "
1845	35.4	+ 5.5	62.7	6.6	56.1	5	inapp	8	2.8	...	...	0.66 "
1846	33.1	+ 3.2	49.6	8.3	41.3	9	1.965	5	2.3	...	...	0.30 "
1847	26.2	— 3.7	43.9	5.6	38.3	5	0 850	6	4.2	...	...	0.71 "
1848	28.6	— 1.3	58.6	0.0	58.6	5	1.220	6	9.7	N 66 W	2.03	5.80 ms
1849	33.5	+ 3.6	53.0	15.1	37.9	7	1.525	2	2.3	N 3 W	1.48	5.37 "
1850	29.8	— 0.1	46.5	7.2	39.3	2	0.745	7	11.2	N 52 W	2.62	7.62 "
1851	32.4	+ 2.5	59.3	12.0	47.3	3	0.770	9	8.8	N 21 W	1.93	7.65 "
1852	27.7	— 2.2	44.8	—7.4	52.2	8	3.080	12	19.5	N 8 W	0.71	5.81 "
1853	30.6	+ 0.7	56.3	0.0	56.3	6	1.080	8	7.1	N 58 W	2.00	5.96 "
1854	30.7	+ 0.8	55.1	7.4	47.7	9	2.425	3	2.8	N 53 W	3.39	8.03 "
1855	28.5	— 1.4	49.4	—2.9	52.3	5	1.485	11	18.1	N 88 W	4.76	9.95 "
1856	23.1	— 6.8	41.4	-14.0	55.4	0	0.000	12	16.2	N 71 W	7.68	11.39 "
1857	27.8	— 2.1	57.6	—5.5	63.1	4	0.335	15	11.3	N 63 W	6.63	10.84 "
1858	28.4	— 1.5	55.4	—5.5	60.9	10	0.917	6	0.2	N 58 W	5.45	8.56 "
1859	36.3	+ 6.4	54.2	9.8	44.4	15	4.054	8	1.0	N 64 W	1.96	10.39 "
1860	34.5	+ 4.6	67.0	12.8	54.2	5	0.882	11	2.4	N 64 W	7.61	12.41 "
1861	26.9	— 3.0	47.4	—5.2	52.6	8	2.125	14	7.1	S 54 W	4.33	10.56 "
1862	28.8	— 1.1	43.2	8.0	35.2	8	2.560	11	18.5	N 12 W	2.50	9.38 "
1863	25.8	— 4.1	42.2	—4.0	46.2	4	0.687	17	11.4	N 27 W	2.62	9.27 "
1864	29.1	— 0.8	50.2	3.0	47.2	9	1.620	12	3.7	N 53 W	2.29	8.41 "
1865	33.6	+ 3.7	55.6	—3.5	59.1	10	3.050	12	18.9	N 61 W	2.16	8.80 "
1866	27.6	— 2.3	45.8	7.5	38.3	8	1.915	18	7.2	N 73 W	6.84	11.51 "
1867	26.6	— 3.3	46.8	3.0	43.8	6	0.617	14	33.4	N 34 W	2.12	8.52 "
Results to 1866.	29.92	...	52.35	2.96	49.39	6.37	1.629	9.7	9.43	N 58 W	3.46	8.83 "
Exc. for 1867.	—3.32	...	—5.55	+0.04	— 5.59	— 0.37	— 1.012	+ 4.3	+ 23.97	...	...	— 0.31 "

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—APRIL, 1867.

Latitude—43° 39'4 *North. Longitude*—5*h*., 17*m*., 33*s*., *West. Elevation above Lake Ontario*, 108 *feet.*

Day	Barom. at temp. of 32°.				Temp. of the Air.				Excess of Mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direc- tion	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6A.M	2 P.M	10PM	ME'N		6 A.M.	2 P.M	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6A.M.	2P.M.	10 P.M.	Re- sult'.	M'N.		
					°	°	°	°	°												°							
1	28.941	29.010	29.158	29.0428	34.9	38.8	36.3	36.67	+ 0.43	.186	.186	.193	.188	92	79	90	87	N N E	W S W	W b S	S 80 W	2.5	14.5	1.5	12.91	13.23	.140	...
2	29.256	.509	.733	.5293	34.5	38.5	31.8	34.72	— 1.92	.144	.112	.123	.125	72	47	68	62	W	W N W	W b N	N 75 W	18.0	26.0	4.0	12.91	13.14	...	...
3	.883	.860	.696	.8018	28.0	39.9	34.9	34.58	— 2.43	.117	.121	.139	.127	76	49	68	64	N W b N	S E B S	N E b E	N 82 E	1.0	5.0	7.6	4.30	5.11	...	...
4	.522	.364	.364	.4085	36.0	45.0	36.0	38.28	+ 0.95	.189	.239	.196	.201	89	80	93	87	E N E	Calm.	E b N	N 71 E	5.0	0.0	13.5	6.23	6.50	1.155	...
5	.177	.138	.177	.1708	33.8	36.3	30.9	33.25	— 4.47	.183	.157	.128	.155	94	74	73	81	E b N	W b S	N b W	N 69 W	4.8	8.0	16.6	6 47	8.65	...	2.2
6	.391	.423	.356	.3920	27.0	41.7	37.4	35.67	— 2.37	.121	.140	.179	.144	82	53	80	69	W	S W	S W b S	S 51 W	6.0	8.5	8.6	7.15	7.98	...	...
7	.294	.528	—	—	37.0	42.5	—	—	—	.176	.173	—	—	79	63	—	—	S W	W b S	Calm.	S 88 W	7.4	20.2	0.0	6.98	8.46	...	...
8	.563	.560	.776	.6463	39.9	39.2	34.5	37.82	— 0.90	.172	.223	.157	.177	69	94	78	78	N E b E	W b S	W	N 49 W	3.7	7.8	6.5	4.43	6.27	.175	...
9	.918	.840	.716	.8127	30.2	42.1	32.0	35.32	— 3.72	.128	.170	.143	.148	76	62	79	71	W S W	S W b W	Calm.	S 12 W	2.0	1.2	0.0	0.34	1.37	...	...
10	.616	.417	.378	.4572	32.4	36.7	35.6	35.27	— 4.15	.146	.179	.177	.166	79	82	85	80	Calm.	N b E	W b N	N 25 W	0.0	1.0	0.4	5.13	5.67	.100	...
11	.484	.548	.526	.5213	25.9	38.1	35.6	33.50	— 6.23	.100	.126	.149	.126	70	55	72	65	N W b N	S S W	S W	N 64 W	17.0	8.4	5.2	5.07	7.23	...	...
12	.483	.444	.456	.4565	32.7	52.6	45.0	44.83	— 4.70	.150	.227	.167	.184	80	57	55	62	S W b W	S b W	N W b N	S 73 W	1.0	0.8	2.2	1.12	4.13	...	...
13	.581	.718	.770	.6965	36.3	39.6	34.5	37.17	— 3.27	.151	.159	.157	.157	71	64	78	71	E N E	E S E	E	N 87 E	7.2	5.5	4.0	6.60	6.94	...	...
14	.768	.722	—	—	36.3	44.1	—	—	—	.168	.178	—	—	78	61	—	—	E N E	E b N	S	N 74 E	8.6	6.4	3.3	5.34	5.69	...	...
15	.502	.414	.372	.4223	43.5	49.7	48.2	47.03	+ 5.98	.231	.287	.332	.290	81	80	98	89	Calm.	E	S S W	S 58 E	0.0	2.5	1.8	0.61	1.21	.205	...
16	.310	.284	.389	.3330	46.4	52.6	45.7	48.35	+ 6.87	.310	.342	.259	.301	98	86	84	88	N E b N	N	N W b N	N 8 W	3.0	11.0	8.5	9.96	10.37	...	...
17	.518	.601	.716	.6235	39.8	57.6	43.9	47.67	+ 5.92	.207	.083	.094	.129	85	16	32	43	N W b N	N W b N	N W b W	N 40 W	10.6	23.6	11.0	15.32	15.92	...	...
18	.906	.956	.912	.9295	38.1	47.9	36.3	40.72	— 1.35	.134	.119	.143	.125	58	34	66	50	N N W	N W	Calm.	N 31 W	10.2	8.0	0.0	3.01	5.09	...	...
19	.843	.762	—	—	37.8	46.1	—	—	—	.173	.170	—	—	77	54	—	—	E N E	E S E	Calm.	N 84 E	3.8	7.6	0.0	4.59	4.79	.007	...
20	.392	.165	.279	.2708	38.9	55.5	44.6	46.80	+ 4.02	.194	.283	.217	.233	81	63	74	72	S E b E	W b N	W b S	West	2.8	0.5	12.2	8.69	10.04	.060	...
21	.396	.421	—	—	40.7	48.6	—	—	—	.180	.202	—	—	70	58	—	—	W	W S W	N E b E	N 64 W	19.0	10.2	2.5	6.24	8.94	...	0.5
22	.231	.182	.489	.3155	33.4	38.1	34.5	35.28	— 8.08	.171	.204	.174	.177	89	88	87	85	N E b N	N N W	N W b W	N 30 W	8.7	13.8	11.2	11.30	12.71	inap.	3.5
23	.649	.751	.852	.7635	32.7	38.9	32.2	34.93	— 8.77	.128	.117	.156	.133	68	49	85	67	N W	W b N	Calm.	N 56 W	13.2	10.8	0.0	4.59	5.77	...	inap.
24	.840	.745	.768	.7820	32.7	33.4	32.4	33.43	—10.57	.165	.178	.169	.169	88	93	91	88	N E b E	E b N	Calm.	N 83 E	3.5	8.8	0.0	4.11	6.46	...	1.0
25	.806	.752	.694	.7438	34.5	45.7	46.8	43.17	— 1.23	.192	.230	.295	.242	96	75	92	86	S W b S	S b W	S S W	S 21 W	5.0	13.2	2.8	6.86	6.96	inap.	...
26	.667	.499	.314	.4775	37.0	54.0	46.1	47.27	+ 2.57	.193	.190	.180	.187	87	45	57	59	S S W	S S W	S b W	S 36 W	1.2	17.0	9.2	10 25	13.10	.055	...
27	.431	.714	.788	.6723	35.6	37.1	29.1	33.38	—11.63	.142	.106	.114	.114	68	48	71	60	W b N	N W b W	N b E	N 31 W	19.2	22.0	5.7	11.74	12.23	...	...
28	.847	.836	—	—	27.3	38.5	—	—	—	.126	.105	—	—	84	44	—	—	N b E	E	E N E	N 88 E	1.0	11.2	8.8	7.93	8.56	...	...
29	.635	.534	.445	.5302	38.5	44.3	46.4	42 90	— 2.83	.182	.248	.259	.229	78	86	82	82	E b N	E b N	S	S 70 E	7.0	11.0	8.0	5.10	6.54	inap.	...
30	.436	.389	.374	.3928	43.2	54.0	48.6	48.48	+ 2.43	.262	.346	.269	.294	94	82	79	86	S	S E b E	N W b N	N 4 W	3.6	3.0	13.0	4.64	7.49	.250	...
...	...	...	...	...	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M	29.5255	29.5127	29.5399	29 5277	35.44	43.89	38.37	39.46	— 1.53	.172	.191	.183	.181	81	66	77	73	......	......	......	......	6.53	9.58	5.60		7.89	2.147	7.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL, 1867.

NOTE.—The monthly means do not include Sunday observations. The daily means, excepting those that relate to the wind, are derived from six observations daily, namely at 6 A.M., 8 A.M. 2 P.M. 4 P.M., 10 P.M., and midnight. The means and resultants for the wind are from hourly observations.

Highest Barometer............................29.958 at 8 a.m. on 18th } Monthly range=
Lowest Barometer ....28.930 at 8 a.m. on 1st } 1.028 inches.

Self-regist'g Thermom.
Maximum Temparature ....65°5 on 20th } Monthly range=
Minimum Temperature ....25°4 on 11th } 40°.1
Mean Maximum Temperature ....47°73 } Mean daily range=
Mean Minimum Temperature ....33°79 } 13°93
Greatest daily range......27°2 from a.m. to p.m. of 12th.
Least daily range............ 5°9 from a.m. to p.m. of 5th.

Warmest day.........30th...Mean Temperature ....48°48 } Difference=15°23
Coldest day .... 5th...Mean Temperature ....33°25 }
Maximum Radiation. { Solar ....108°.0 on 13th } Monthly range=93°6
{ Terrestrial .... 14°.4 on 3rd }

Aurora observed on 2 nights, viz.:—8th and 24th
Possible to see Aurora on 15 nights; impossible on 15 nights.
Snowing on 5 days; depth 7.2 inches; duration of fall 27.1 hours.
Raining on 12 days; depth 2.147 inches; duration of fall 56.3 hours.
Mean of Cloudiness=0.62.
Most cloudy hour observed 2 p.m.; Mean=0.67; least cloudy hour observed 10 p.m.; Mean=0.54

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2145.18	930.47	1270.67	2771.31

Resultant Direction N. 51° W.; Resultant Velocity 2.68 miles per hour.
Mean Velocity 7.89 miles per hour.
Maximum Velocity 30.5 miles from 6 to 7 p.m. of 20th.
Most Windy day 17th; Mean Velocity 15.92 miles per hour. } Difference 14.71
Least Windy day 15th; Mean Velocity 1.21 do } miles.
Most Windy hour 10 a.m.; Mean Velocity 10.37 do } Difference 4.98 miles.
Least Windy hour 10 p.m.; Mean Velocity 5.39 do }

3rd, Solar halo. 4th, heavy rain storm.
9th Solar halo, lunar halo at 10 p.m.
14th, Solar halo. 16th, dense fog.
20th, Thunder storm.
6th, Robins numerous. 14th, Wild Pigeons passing N.
16th, Woodpeckers numerous. 20th, Frogs heard.
25th, Swallows and Butterflies seen.
1st, Bay clear of ice. 13th, First Steamer arrived "City of Toronto."

COMPARATIVE TABLE FOR APRIL.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
										Resultant.		Mean Force or Velocity
	Mean.	Excess above aver'ge	Maximum.	Minimum.	Range.	No. of days.	Inches.	No. of days.	Inches.	Direction.	Velo'y.	
1840	° 42.4	° + 1.2	° 68.7	° 22.8	° 45.9	14	3.420	2	...	...	...	...
1841	39.2	— 2.0	64.8	19.9	44.9	3	1.370	3	...	...	...	0.51 lbs
1842	43.1	+ 0.9	89.8	20.1	69.7	8	3.740	2	...	...	...	0.57
1843	40.9	— 0.3	71.6	14.7	56 9	7	3.185	3	0.1	...	...	0.46
1844	47.5	+ 6.3	74.6	14.9	59.7	10	1.515	1	inap.	...	...	0.24
1845	42.1	+ 0.9	66.7	15.5	51.2	11	3.290	4	1.5	...	...	1.00
1846	44.0	+ 2.8	81 8	24.2	57.6	10	1.300	2	1.3	...	...	0.55
1847	39.2	— 2.0	65.1	9.3	55.8	8	2.870	2	4.0	...	...	0.59
1848	41.3	+ 0.1	65.1	22.7	42.4	5	1.455	1	0.5	N 77 W	1.46	4.89mls
1849	39.0	— 2.2	72.0	15.5	56.5	10	2.655	2	1.7	N 43 W	3.14	7.50
1850	37.9	— 3.3	65.7	18.0	47.7	7	4.720	2	1.1	N 39 W	1.12	7.64
1851	41.3	+ 0.1	59.3	25.8	33.5	11	2.295	3	1.2	N 14 E	2.52	8.07
1852	38.2	— 3.0	53.8	20.0	33.8	6	1.990	4	9.4	N 23 E	2.44	6.68
1853	41.9	+ 0.7	65.7	25.0	40.7	10	2.625	1	1.0	N 12 W	1.95	5.20
1854	41.0	— 0.2	64.5	20.2	44.3	12	2.685	4	2.7	N 50 E	2.57	6.81
1855	42.4	+ 1.2	69.4	10.7	58.7	8	2.030	3	1.6	N 36 W	3.99	7.57
1856	42.3	+ 1.1	72.2	14.2	58.0	13	2.780	3	0.1	N 29 E	1.64	6.05
1857	35.4	— 5.8	52.0	5.9	46.1	10	1.755	11	12.9	N 60 W	4.15	10.24
1858	41.5	+ 0.3	65.2	21.8	43.4	13	1.642	2	0.1	N 14 W	1.64	9.57
1859	39.5	— 1.7	64.8	22.6	42.2	9	2.527	8	1.2	N 36 W	2.33	10.79
1860	39.5	— 1.7	61.8	19.5	42.3	11	1.282	5	0.3	N 37 W	4.10	10.30
1861	42.0	+ 0.8	67.0	23.8	43.2	12	1.619	4	6.9	N 37 E	2.31	8.90
1862	39.6	— 1.6	68.0	14.5	53.5	10	2.235	4	0.2	N 50 E	2.48	9.77
1863	42.0	+ 0.8	69.0	8.6	60.4	8	2.210	4	1.6	N 14 E	3.75	9.20
1864	40.9	— 0.3	59.4	28.1	31.3	16	3.633	3	3.5	N 41 E	3.39	7.77
1865	43.1	+ 1.9	62.5	23.0	39.5	17	3.972	6	2.0	N 84 W	2.11	8.39
1866	43.9	+ 2.7	71.0	28.5	42.5	7	1.675	2	inap.	N 42 W	3.34	7.95
1867	39.5	— 1.7	65.5	25.4	40.1	12	2.147	5	7.2	N 51 W	2.68	7.89
Results to 1866.	41.19	...	67.09	18.88	48.21	9.85	2.462	3.4	2.29	N 13° W	2.03	8.07
Excess for '67.	— 1.69	...	— 1.59	+ 6.52	— 8.11	+ 2.15	— 0.315	+ 1.6	+ 4.91			— 0.18

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